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# **THE REVIEW OF APPLIED ENTOMOLOGY.**

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FAES (H.), STAEHELIN (M.) & BOVEY (P.). **La lutte contre les ennemis de la vigne en 1932.**—*Landw. Jb. Schweiz* **47** no. 10 pp. 1147–1159. Berne, 1933. (With a Summary in German.)

In the Lausanne region in 1932, the weather was cooler than usual from April to July, but August was hot and dry. The adults of the overwintered generation of *Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff., occurred from 20th May to 21st June, but they were not abundant and their activity was affected by the temperature. In the case of *C. ambiguella*, however, the first-brood adults, which were observed from 28th July to 19th August, with a maximum flight between 31st July and 2nd August, were much more numerous, and an outbreak of the second-brood larvae occurred on the vines.

The percentage of the first brood of *C. ambiguella* killed by two applications, on 2nd and 9th June, of 1 per cent. Bordeaux sprays containing 1.5–2 per cent. summer oil or 1 per cent. nicotine as an ovicide was 95–100, as compared with 79–87.5 by 1 per cent. sprays of lead or calcium arsenate applied at the same dates against the larvae [cf. **20** 538]. The inferior effectiveness of the latter may have been due to the fact that, owing to the cold weather, the development of the vine was retarded and the buds were still too close to allow the sprays to penetrate. A proprietary soap-pyrethrum spray applied on 6th July killed all the larvae. Against the second brood, two applications, on 8th and 15th August, of the sprays containing oil or nicotine were generally satisfactory, whereas a single treatment (on 8th August) failed to protect the crop.

**Festschrift zum 60. Geburtstag von Enoch Zander.**—132 pp. Leipzig, Liedloff, Loth & Michaelis, 1933. Price M. 1.50. (Abstr. in *Bee World* **14** pp. 92, 115–116. Camberley, Surrey, 1933.)

This publication includes a paper entitled "Investigations on the Large Wax Moth," by A. Borchert, and one "On the Identity of the Harmless and Pathogenic Mites occurring in Hives," by K. Freudenstein.

In the first, it is stated that the food consumed by a larva of *Galleria mellonella*, L., rises from 2 mg. in the fourth instar to 43.6 in the ninth, so that the larvae from the eggs of one female eat about  $\frac{1}{6}$  lb. of comb in all. There are more males than females, and one female lays an average of 1,152 eggs.

In the second paper, the morphology and anatomy of *Acarapis woodi*, Rennie, and *A. woodi externus*, Morgenthaler, are described. The two forms were found to be very similar [cf. *R.A.E.*, **A** **20** 237], but the external form has longer legs. Much of the work was carried out on material collected in England. The mites are more sensitive to the effects of pungent substances than the bee, but they do not appear to have any olfactory sense, and the author does not believe that remedies act by preventing the females from finding the tracheae of the bees by smell. Neither form is able to live apart from the host. They reproduce in late autumn and winter during swarming and spread to new hosts in spring. Females are commoner than males, but the author believes that the sexes are equal at breeding time. Experimental blocking of the spiracles of bees with a mixture of resin, beeswax and olive oil induced symptoms resembling those of infestation by mites, and the author concludes that the crawling habit of infested bees may be due to shortage of oxygen for the flight-muscles caused by the blocking of the spiracles by mites, rather than

to their sucking the blood. The absence of any immunity in special races of bees was confirmed. It is suggested that immunity of older bees [17 286] is due to mechanical causes. The author advances the hypothesis that the internal form of the mite originated in the Isle of Wight at the beginning of the present century. An announcement is made of the discovery by Homann of a new breeding place of the external mite [cf. 19 736] in the neck-furrow of a bee.

MORGENTHALER (O.). **The "External" Mite.**—*Bee World* 15 no. 1 pp. 5-6. Camberley, Surrey, January 1934. (Transl. from *Schweiz. Bienenztg.* Dec. 1933.)

This paper describes the continued success of measures against acarine disease of bees in Switzerland [cf. *R.A.E.*, A 20 144], and records the discovery in that country, and in numerous samples from other countries, of *Acarapis woodi externus*, Morgenthaler, breeding in the neck-furrow of bees [cf. preceding abstract]. The larvae and eggs adhered to the edge of the hard chitin at the beginning of the membranous parts of the neck. The sedentary larvae and the active adults pierced the soft skin and sucked the blood. These mites appeared to belong to the long-legged race, and those found on the back to the short-legged one. The effect on the bees of a heavy infestation is not known.

BÖNING-SEUBERT (E.). **Die Mosaikkrankheit der Gurken.** [Cucumber Mosaic Disease.]—*Prakt. Bl. Pflanzenb.* 11 no. 9-10 pp. 215-221, 18 refs. Freising, 1934.

Very little has been published in Germany on cucumber mosaic, though it is an important disease of cucumbers in many localities. Existing records of transmission by insects, chiefly Aphids, in the United States are quoted [*R.A.E.*, A 9 306; 14 12; 17 282; etc.].

KORFF (G.) & BÖNING (K.). **Selleriewanzen und ihre Bekämpfung.** [Celery Bugs and their Control.]—*Prakt. Bl. Pflanzenb.* 11 no. 9-10 pp. 221-226, 3 refs. Freising, 1934.

In the Munich district, where celery had been attacked in 1926 by *Calocoris sexguttatus*, F., it was seriously injured in 1932-33 by *Lygus campestris*, Fall. In laboratory tests, all the adults were killed by a spray of 2 per cent. kerosene and 0.125 per cent. soft soap, and 90 per cent. of them by 0.5 per cent. lysol and 2 per cent. soft soap. A 1-2 per cent. solution of soft soap alone killed 80-95 per cent., which is sufficient for practical control; the percentage killed was raised to 100 by the addition of 1 per cent. quassia chips and reduced to 10-15 by that of 2 per cent. tobacco extract. In field tests, a spray of nicotine and soap proved disappointing, but a solution of soft soap containing a proprietary preparation of pyrethrum (Chrysanthol) proved superior to soap alone. Chrysanthol therefore seemed superior to ordinary pyrethrum powder, as the addition of the latter to soft soap had resulted in decreased efficiency in the laboratory tests.

KORFF (G.) & BÖNING (K.). **Rettichsamenschädlinge und ihre Bekämpfung.** [Radish Seed Pests and their Control.]—*Prakt. Bl. Pflanzenb.* 11 no. 9-10 pp. 226-230. Freising, 1934.

*Meligethes aeneus*, F., and the Pyralid, *Evergestis extimalis*, Scop., often endanger the radish seed crop in Bavaria. *M. aeneus* may be

captured on sticky boards carried or drawn along the rows of plants. Plants treated with a pyrethrum dust, with or without an arsenical, had many more seed-pods, but the seeds were less well developed and lighter than those of untreated plants. As the thinning effected by *M. aeneus* enhances the quality of the seed, dusts should only be applied if infestation is severe when flowering is poor.

The increase of *E. extimalis* is due to the destruction of its natural enemies. The general practice of threshing the pods destroys the pupae of Braconid parasites of the genus *Microgaster* remaining in them after the death of the hosts. Infested pods should be placed in dry, airy, sheltered places to permit of parasite emergence, and for the same reason harvest debris should be preserved. Tests of insecticides did not give promising results. The caterpillars may be collected by hand.

ECKSTEIN (K.). **Neues aus der Lebensgeschichte des Hausbockes.**

[New Data on the Biology of *Hylotrupes bajulus*.]—*Anz. Schädlingssk.* **10** no. 1 pp. 8–11, 7 figs., 6 refs. Berlin, January 1934.

In continuation of previous observations on *Hylotrupes bajulus*, L., in Germany [*R.A.E.*, A **9** 29], experiments were carried out from 1925 to 1933 to ascertain the length of the life-cycle, billets to which the adult beetles were given access at certain dates being kept at room temperature under constant observation. Most of the adults emerged four years after the eggs had been laid, though some appeared in the third year.

From pieces cut from telegraph poles in 1931 and 1932, a large emergence of this Cerambycid was expected, but instead there appeared in 1933 hundreds of females of a Braconid of the genus *Rhoptrocentrus*, apparently a parasite of the young larvae. Only one example of the predacious Clerid, *Opilo domesticus*, Sturm [*cf.* **17** 463] was found in the larval mines.

THOMSEN (M.). **Sprøjtemidler til Bekaempelse af Chermes paa Aedelgran.** [Spraying Materials against *Chermes* on Silver Fir.]—*Forstl. Forsøgsv. Danm.* **13** (Beretn. no. 108) reprint 10 pp., 4 refs. Copenhagen, 1933. (With a Summary in German.)

Tests in the control of *Chermes (Dreyfusia) nüsslini*, Börner, on silver fir [*Abies*] with lysol [*cf.* *R.A.E.*, A **14** 341] or tar distillates in two localities in Denmark during 1929–1932 show that spraying should be completed before the buds open, in order to avoid injury to the young shoots and to reach the Aphids in the susceptible winter-larval (sistens) stage and not in the resistant egg-stage. Better results were obtained at less cost with either of two commercial oil emulsions at 5 per cent. strength than with a proprietary tar distillate at 5 per cent. The latter at 3 per cent. and lysol at 3 or 5 per cent. were definitely inferior. Lime-sulphur (10 per cent.) had little effect on the Aphids. The control obtained with the oil emulsion sprays was sometimes higher than 99 per cent., but the few winter larvae that survived in sheltered situations would eventually build up an injurious infestation.

SERVADEI (A.). **Nota su un nuovo Dittero Antomiide (*Hylemyia servadeii* Séguy) dannoso alle Iridacee del gen. *Iris*.** [A Note on a new Anthomyiid, harmful to the Genus *Iris*.]—*Bol. Lab. Ent. Bologna* 6 pp. 93-114, 12 figs., 1 pl., 2 refs. Bologna, 12th December 1933.

In the spring of 1932, flower-buds of *Iris germanica* at Bologna were found infested by larvae of an Anthomyiid described in 1933 by Séguy as *Hylemyia servadeii*. All stages are described in detail. Besides *I. germanica*, *I. florentina* and *I. pallida* are attacked, nearly all the flowers being destroyed in the infested area. The adults emerge from overwintered pupae from about mid-March to 10th April, immediately appearing at the surface of the ground. They feed on sugary substances, are on the wing during the hot hours of the day, and live 20-35 days. They mate 3-4 days after emergence and oviposit after another 3-4 days. The eggs are laid in the flower-buds, 6-8 in each. The larvae hatch in 5-6 days at 11°C. [51.8°F.], and at once begin to feed on the anthers, afterwards passing to the petals, ovary and flower-stem. About 10th May, they begin dropping to the ground, where they remain as pupae until the following spring.

The only feasible control measure appears to be the collection and destruction of all infested buds, though it may be possible to cultivate varieties of *Iris* that do not flower in March-April.

JARY (S. G.) & AUSTIN (M. D.). **Department of Entomology** [Report 1932-33].—*J. S.-E. agric. Coll.* no. 33 pp. 9-16. Wye, Kent, January 1934.

Brief notes are given on the work carried out, and the insect pests observed in south-eastern England during 1932-33. The latter include: *Macrosiphum onobrychis*, Boy. (*pisi*, Kalt.), *Kakothrips pisivorus*, Westw. (*Frankliniella robusta*, Uzel) and *Cydia nigricana*, Steph., on peas; *Phorbia* (*Chortophila*) *cilicrura*, Rond., on french beans; Aphids of the genus *Cavariella*, which were as injurious as *Psila rosae*, F., on carrots; *Phyllobius pyri*, L., *P. oblongus*, L., and *Otiorrhynchus singularis*, L., damaging newly planted fruit trees in nurseries; *Rhynchites coeruleus*, DeG., *R. aequatus*, L., and *Hoplocampa testudinea*, Klug, on apple; and *H. flava*, L., on Czar plums. Both the species of *Hoplocampa* were responsible for serious damage. *Eriophyes essigi*, Hassan, caused "red berry" on cultivated blackberries [cf. *R.A.E.*, A 21 539].

PIERCE (W. D.). **At what Point does Insect Attack become Damage?**—*Ent. News* 45 no. 1 pp. 1-4. Philadelphia, Pa, January 1934.

In attempting to compute damage to crops by insect pests, the approximate normal shedding of fruit, etc., by the plant and the amount of thinning advisable to obtain the greatest yield of the best quality must be deducted from the apparent loss caused. In the Philippines, sugar-cane fields where extensive pruning had been necessary owing to infestation by borers causing dead-heart apparently produced the same average number of canes as uninfested fields; in the former, however, the canes took 2-3 months longer to mature, so that in 5 years unattacked cane would produce 5 crops, as against 4 produced by badly attacked cane. The prevalent belief that these borers caused no actual loss was therefore unjustified. The length

and diameter of canes bored by the weevil, *Trochorrhopalus stragulatus*, Gyll., and the purity and yield of the sugar were found to be below normal. On the other hand, a better crop of sugar was produced in a cane-field after it had been stripped to the ground by an outbreak of *Laphygma exempta*, Wlk.

Reference is made to recent papers on the points at which *Anthonomus pomorum*, L., and *Tirathaba rufivena*, Wlk., become of economic importance on apple and coconut respectively [*R.A.E.*, A 20 233; 19 295].

CHATTERJEE (N. C.). **Entomological Investigations on the Spike Disease of Sandal (12). The Life-history and Morphology of *Eurybrachys tomentosa* Fabr. Fulgoridae (Homopt.).—*Indian For. Rec.* 18 pt. 13, 26 pp., 2 pls., 18 refs. Delhi, 20th December 1933. Price 1s. 3d.**

*Eurybrachys tomentosa*, F. (*apicalis*, Wlk., *dilatata*, Wlk.), the synonymy of which is discussed, is widely distributed on sandal (*Santalum album*) in southern India [*R.A.E.*, A 20 374], including that affected by spike disease, of which it is possibly a vector. It is next in abundance to *Sarima nigroclypeata*, Melich. [22 14], with which the younger stages may be confused. The morphology of all stages of the Eurybrachid is described, and a list is given of 19 additional food-plants, including cotton and *Cajanus indicus*. The feeding of large numbers of nymphs and adults checks the growth of the shoots of sandal and may lead to the withering and fall of the leaves and the dying back of the shoots and twigs, thus contributing to the general condition of thin crowns and stag-headedness in sandal forests. One-year-old seedlings shed their leaves and dried up in 10 weeks as the result of the feeding of 12 of the bugs. Oviposition begins 10 days after pairing. As many as 6 clusters of 30–42 eggs are laid on the leaves, shoots or boles by a single female; when 5–8 eggs have been laid, the female covers them with a white flocculent material. Hatching occurred in an average of 18·9 days between 79 and 87°F. during May, June and August. The five nymphal instars are completed in an average total of 100 days, and the adults live for over 2 months and oviposit for a long period. Both sexes are present in equal numbers. In the field, three overlapping generations occur and activity continues throughout the year.

GLOVER (P. M.). ***Aspidiotus (Furcaspis) orientalis*, Newstead (Coccidae), its Economic Importance in Lac Cultivation and its Control.**—*Bull. Indian Lac Res. Inst.* no. 16, 23 pp., 2 figs., 1 pl., 24 refs. Calcutta, 1933. Price 1s. 4d.

The species of *Aspidiotus* attacking *Zizyphus jujuba* and *Schleichera trijuga*, important food-plants of *Laccifer lacca*, Kerr, in India [*R.A.E.*, A 21 130], has been identified as *A. orientalis*, Newst., the various stages of which are described. Records are given from the literature of numerous other plants attacked in various parts of the Indian region. The scales occur on the stems, twigs and trunks of *Z. jujuba* and *S. trijuga* and on both surfaces of the leaves of the latter. *Z. jujuba*, which is more severely attacked, appears to become relatively immune when more than 2–4 years old, whereas very young trees of *Schleichera* are not often attacked and the older ones appear to

be all equally susceptible. Both these trees, which are themselves of some economic importance, may be retarded in growth or even killed, and are rendered unsuitable for inoculation with *L. lacca*. *A. orientalis* is potentially of importance also on *Butea frondosa*, another food-plant of lac, on the twigs of which it was first observed in April 1933. It occurs on the stems and both surfaces of the leaves of roses, which may be severely injured and which form sources of re-infestation if neglected during the application of control measures.

Infestation may be checked and incipient outbreaks controlled by pruning and burning the rubbish and by spraying [*loc. cit.*], which should be carried out at least 3 times annually during the periods October–November, February–March and May–June, when *A. orientalis* is most abundant and when the trees are usually cut preparatory to inoculation with *L. lacca*. Only the new wood should be pruned, the old being removed only on severely infested trees that have been neglected or badly pruned. A spray of 100 lb. sulphur, 50 lb. lime and 140 gals. water was more satisfactory than resin and crude oil, nicotine and soap or an emulsion of kerosene and soap. The spray is toxic to *L. lacca* and causes injury to tender shoots and leaves, from which, however, both trees rapidly recover. It should therefore be used preferably on trees capable of withstanding pruning, or else as a winter wash. Experiments indicated that less liquid is used and greater mortality caused when it is painted on the trees, though this method can only be employed where labour is cheap. Some females that had been wetted with the spray were still alive after 15 days; they appeared unhealthy, however, and most of their offspring died. The value of systematic control measures is demonstrated by a comparison of the conditions at Namkum (Bihar & Orissa), where infestation has occurred since 1926 and control measures have been carried out since 1929, with a neighbouring plantation where control was not initiated until 1932. The cost of operations is briefly discussed.

*A. orientalis* was attacked in the field by the larvae of a Nitidulid, *Cybocephalus* sp., and of the Coccinellid, *Chilocorus nigritus*, F. It was also preyed on by the larva of *Eublemma scitula*, Ramb., and is an important alternative host of the Eulophid, *Tetrastichus purpureus*, Cam., both these being natural enemies of *L. lacca* [19 26]. An Aphelinid, *Perissopterus* sp., a primary parasite of the males and probably a hyperparasite of the females of *L. lacca*, parasitises Chalcidoid parasites of *A. orientalis*. Natural enemies are not, however, of any great value in the control of this Coccid.

KING (C. B. R.). **The Tea Tortrix** (*Homona coffearia* Nietn.).—*Tea Quart.* 6 pt. 4 pp. 153–175, 1 graph, 20 refs. Talawakelle, Ceylon, November 1933.

Although *Homona coffearia*, Nietn. (tea tortrix) has a fairly wide distribution in Ceylon, it is a severe pest only in the denser part of the tea belt, generally occurring at altitudes between 3,000 and 6,000 feet. The details here recorded of the life-history, which varies with the altitude, differ in some respects from those previously noticed [*R.A.E.*, A 15 218]. The female lays one egg-mass, or sometimes two, containing from 10 to 500 eggs each, with an average of about 130, which hatch in 6–11 days; at high elevations, the larval period is 5–6 weeks, the pupal 7–10 days and the complete life-cycle 8–10

weeks. The adults emerge most frequently at sunset or shortly after. A list is given of plants on which the larvae have been found.

In 1930-1933, a first generation of adults emerged in August, a second in late October, and a third at the end of December or the beginning of January. This generation is the most important, because oviposition continues longer (3-4 weeks), more egg-masses are laid, and plants of the highest quality are flushing at this time. When the third generation is large, a fourth emerging in March, and a small fifth in May or June may attract notice, but the numbers of larvae early in the year are considerably reduced by parasites and wilt disease, the latter being apparently the chief factor in natural control.

Parasites, besides those already recorded [21 405], include several unidentified Hymenoptera. The larval and pupal parasites are most frequent between March and May, but several species were numerous between December 1932 and February 1933. Natural parasitism of the eggs by *Trichogramma erosicornis*, Westw., rarely exceeds 0.1 per cent., owing largely to the short time during which the egg-masses are abundant. Its life-cycle requires 15-20 days, so that it can only complete two generations before they decrease in numbers. If this parasite is to be used for the control of the Tortricid [cf. 17 414], about 2,000 millions would be required for the 200,000 acres involved, and if it is reared on the eggs of *Ephestia kühniella*, Zell., only 80 per cent. of these will be parasitised; moreover, as *H. coffearia* is scarce at certain seasons, the parasite would die out in the field and have to be replaced annually. The cost of artificial rearing on this scale would be high. After briefly reviewing work with *Trichogramma* spp. in other countries, the author concludes that this method of control does not promise much likelihood of success.

Of other methods of control discussed, the only one considered likely to be of value is carefully timed collection of the egg-masses at the peaks of the oviposition periods.

POILANE (—). **Notes sur les abeilles et l'apiculture en Indochine.**—*Rev. Bot. appl.* **13** no. 146-147 pp. 808-811. Paris, 1933.

Notes are given on the habits of three species of wild bees, with regard to the possibilities of domesticating them in Indo-China, where they are abundant and widely distributed. The natives usually obtain honey from *Apis dorsata*, F., though that produced by *A. florea*, F., is reported to be the best. *A. indica*, F., is, however, the only species that can be domesticated: it is perhaps of greater value for the production of wax than of honey. All three species are frequently attacked by ants, and the hives of *A. indica* also by wax moths [*Galleria mellonella*, L.] and termites.

BETREM (J. G.). **Orienteerende proeven met blauwzuurgas tegen witte luis en takkenboeboek.** [Preliminary Experiments with Hydrocyanic Acid Gas against Mealybugs and Twig-borers.]—*Arch. Koffiecult. Ned.-Ind.* **7** no. 2 pp. 84-103, 2 figs., 3 pls., 25 refs. Surabaya, December 1933. (With a Summary in English.)

These experiments in the tent fumigation of coffee bushes with hydrocyanic acid gas to eliminate mealybugs aimed at discovering a method not of practical control but of gauging comparatively the actual loss

caused by infestation. A dust containing 40–50 per cent. calcium cyanide, spread on the ground by means of a hand-duster at the rate of 2·7 oz. per 100 cu. ft., killed over 90 per cent. of *Pseudococcus citri*, Risso, and *Ferrisia virgata*, Ckll., without harming the plants in daylight fumigation. A dosage of 4 oz. did not kill more mealybugs, but the mortality obtained was sufficient for the purpose in view. *Coccus* (*Lecanium*) *viridis*, Green, was completely eradicated. Fumigation proved useless against the twig-borer, *Xyleborus morstatti*, Hag., very little success being achieved even when the dust was applied at the rate of 8 oz. in closed glass cases.

TOLLENAAR (D.). **Jaarverslag** [Annual Report of the Vorstenland Tobacco Experiment Station, Java] **1 Mei 1932—30 April 1933**.—*Meded. Proefst. vorstenl. Tabak* no. 77, 115 pp., 3 figs. Klaten (Java), 1933. [Recd. February 1934.]

In his report on the work of the phytopathological division (pp. 34–48), T. Thung states that *Myzus persicae*, Sulz., caused little injury to tobacco, but that thrips were very harmful in the seed-beds and fields. In one instance, they had apparently migrated from cucumber plants when the latter were pulled up. Seed plantations of *Crotalaria juncea* were attacked by *Lampides* (*Lycaena*) *baetica*, L., *Utetheisa* (*Deiopeia*) *pulchella*, L., *Argina cribraria*, Clerck, and *Etiella zinckenella*, Treit. *C. anagyroides* suffered less from these but more from the Capsid, *Ragnus importunitas*, Dist.

LEVER (R. J. A. W.). **Entomology and Agriculture in the British Solomon Islands**.—*Trop. Agriculture* **11** no. 2 pp. 36–37, 6 refs. Trinidad, February 1934.

Notes are given on pests of coconut in the British Solomon Islands, most of the information having already been noticed [*R.A.E.*, A **21** 207, 359; **22** 63]. The species of *Calliceras* reared from *Apanteles tirathabae*, Wlkn., parasitising *Tirathaba rufivena*, Wlk. [**21** 625] is here stated to be *C. fijiensis*, Ferrière [**21** 360].

HILL (G. F.). **Notes on Porotermes and Calotermes (Isoptera) from the Australian Region, with Descriptions of new Species**.—*Proc. roy. Soc. Vict.* **46** pt. 1 pp. 36–50, 2 pls., 4 refs. Melbourne, 22nd December 1933.

This paper comprises a discussion of the synonymy and distribution in Australia of *Porotermes adamsoni*, Frogg., biological notes on *Calotermes repandus*, Hill, in Samoa and Fiji, *C. irregularis*, Frogg., in Queensland and Thursday Island and *C. convexus*, Wlk., in Tasmania, further descriptions of and notes on *C. spoliator*, Hill, and *C. tillyardi*, Hill, in the Federal Capital Territory, and the former also in New South Wales, notes on the synonymy, habits and distribution of *C. buxtoni*, Hill, in Samoa, Tonga, Fiji, Thursday Island, etc., and descriptions of three new species from New South Wales, *C. neotuberculatus*, also from the Federal Capital Territory, *C. queenslandis*, also from Queensland, and *C. atratus*.

All the above species are of importance in the destruction of seasoned constructional timber or living trees [*cf.* *R.A.E.*, A **19** 116].

JARVIS (E.). **Division of Entomology. Northern Station, Meringa** [1932-33].—*Rep. Bur. Sug. Exp. Stas Qd* **33** pp. 62-66. Brisbane, 1933.

In Queensland, white arsenic has recently been reported to show promise against larvae of *Lepidoderma albohirtum*, Waterh., on sugar-cane in spite of previous failure [*R.A.E.*, A **8** 466], but in plots treated with 60 or 200 lb. per acre living grubs were still present after 4 months. Hand-collection of the adult cockchafer is considered of value for control, and it is pointed out that the expense of this measure would be reduced and its effectiveness increased if *L. albohirtum* only were taken and *Lepidiota frenchi*, Blkb., ignored.

It has been found quicker to remove puparia of *Ceromasia sphenorhori*, Villen., from cane sticks containing cocoons of *Rhabdocnemis obscura*, Boisd., in the field and allow the adults to emerge in the laboratory than to rear the Tachinid under artificial conditions. Since August 1933, 1,428 flies have been released on 21 farms, and indications of the spread of the parasite have been obtained. The larvae usually die in canes that lie for a long time exposed to the sun, though pupae often survive. Where the parasite was not present, unusually severe damage was caused by the weevil.

MCDUGALL (W. A.). **Division of Entomology. Central Station, Mackay.**—*Rep. Bur. Sug. Exp. Stas Qd* **33** pp. 66-67. Brisbane, 1933.

The larvae and adults of *Pentodon australis*, Blkb., were less injurious to sugar-cane in 1932-33 than they had been for three years, though some damage was caused to early plant cane. Extensive areas, usually those adjacent to headlands or in grassy fields, were lightly infested by *Phragmatiphila truncata*, Wlk., which is not generally of much importance. In one or two localities, *Rhabdocnemis obscura*, Boisd., was observed on the softer varieties growing in damp scrub or on cane obtained from infested plants. In one field, borer infestation was due to Longicorn larvae, which appeared to live only in the numerous dry, dead sticks. Wireworms were injurious in many fields early in the year, but rains in July delayed much of the planting until September or early October, and most of the plants became successfully established in infested land. The unidentified species of *Lacon* observed in the previous year [*R.A.E.*, A **21** 152] has been determined as *L. variabilis*, Cand., and a wireworm occurring in highland districts as *Heteroderes carinatus*, Blkb.; other common species are *H. cairnsensis*, Blkb., *L. lateralis*, Schwarz, *L. humilis*, Er., and *L. assus*, Cand. Except for the last-named, all these Elaterids, and many others, have life-cycles of one year in this district [cf. **20** 187]. Damage may occur in soils containing 0.9-5.4 per cent. organic material; the percentage does not appear to be correlated with attack by *L. variabilis*. Weekly soil examinations from October to June showed that excessive moisture is necessary during December, January or February for the establishment of the wireworms, which may become troublesome if cane is planted on badly drained land during the following 8-9 months. Success was again obtained by draining land infested with *L. variabilis* [**21** 152].

*Neomaskellia (Aleurodes) bergi*, Sign., *Aphis sacchari*, Zehnt., and the nymphs and adults of *Perkinsiella saccharicida*, Kirk., failed to transmit dwarf disease of sugar-cane, which appears to be confined to a small portion of this district and is thought to be due to a virus.

MUNGOMERY (R. W.). **Division of Entomology. Southern Station, Bundaberg.**—*Rep. Bur. Sug. Exp. Stas Qd* **33** pp. 67–70. Brisbane, 1933.

Work on the transmission of Fiji disease of sugar-cane by insects, including positive results with *Perkinsiella saccharicida*, Kirk., has been previously noticed [*R.A.E.*, A **21** 520]. Though damage by *Pseudoholophylla furfuracea*, Burm., was particularly light in the southern districts in 1932–33, it occurred sporadically in some fields following rain in early spring and is still the chief pest in this area. Proper and well-timed cultural operations to reduce the number of larvae before planting are cheaper and more effective than soil fumigation. A further consignment [*cf.* **20** 163] of larvae of *Microphthalma michiganensis*, Tns., was sent from Canada in larvae of *Lachnosterna* for the control of this Dynastid. On arrival in November, 85.4 per cent. of the grubs were alive, but only 10.8 per cent. were parasitised. Of the 207 adult Tachinids obtained, 160 were liberated in January and February; infestation at the time was light, and no evidence of the establishment of the parasite has yet been obtained. The view held by many growers that the conservation of cane trash in the fields increases infestation by Lamellicorn larvae has arisen owing to confusion between these larvae and those of Noctuids, which are sometimes abundant on the shoots of young ratoon crops where trash remains on the ground. On land typical of that commonly infested by *P. furfuracea* on which trash had been conserved for the past 10 years and conditions were favourable for the development of large populations owing to the carrying of the previous crop of cane to the fourth ratoon (5 years), the number of grubs found was practically negligible.

Severe infestation by *Cirphis unipuncta*, Haw., occurred during the spring and summer in several fields where trash had been conserved and where young cane had been subject to frosts and therefore had much dead trash adhering. Baits of bran and Paris green gave good control in some cases. Parasites were rather scarce, a Tachinid and an Ichneumonid, *Henicospilus* sp., being the most numerous.

Overwintering larvae of *Rhyparida morosa*, Jac., bored into cane setts in newly ploughed grassland, eating the more succulent tissues and destroying the eyes and shoots; land to be planted should be prepared 6–12 months in advance, so as to prevent this Eumolpid and other native grassland pests from attacking the newly planted cane. During the spring, setts were destroyed by wireworms in soils that are for the most part well drained and not superficially comparable to the low-lying fields near Mackay, where damage is usually severe [see preceding paper]. A Coccid, *Margarodes* sp., was found in large numbers in the encysted stage attached to cane roots in a sandy loam soil; during October–November, the adult females emerged and oviposited in the soil at depths of 3–6 ins.

KUZIN (B. S.). Кузин (Б. С.). **The Development and Mode of Life of the Coccids of the Genus *Margarodes*.** [*In Russian.*]—*Abstr. Works zool. Inst. Moscow St. Univ.* pp. 21–24. Moscow, Medgiz, 1933.

With a view to finding an indigenous source of cochineal, investigations were carried out in 1929–31 in Transcaucasia and Central Asia on the possibility of utilising Coccids of the genus *Margarodes*. *M. hameli*, Brandt, all stages of which are briefly described, was found in

the Erivan region, and several unidentified species in Kazakstan, Uzbekistan and Turkmenistan. The adults of *M. hameli*, which do not feed, appear at the end of September, congregating in the early morning on the soil and re-entering it at about 10 a.m.; the females also climb on to the stems of various plants, and the males swarm in the air a short distance above the ground. The males die soon after pairing, but the females live in the soil for a long time. The eggs are laid, probably at the end of October or in November, in cells made of tangled waxy threads near the roots of the food-plants. In the laboratory at Moscow, they hatched in November or December. The larvae attach themselves to the roots of the grass, *Aeluropus littoralis*, or the reed, *Phragmites communis*. In the second instar, they are enclosed in hard waxy cases with particles of soil adhering to them, the whole forming a good protection against unfavourable conditions. The male larvae abandon their cases some 20–25 days before the females, and in the mornings congregate on the surface of the soil; at this stage they are very similar to the adult females and apparently do not feed. After pupating in the soil within covers of fine waxy down, they emerge as alate adults at the same time as the females leave their larval shields. The adult females of this genus should be considered as a neoteinic form.

The bionomics of the species found in Central Asia are somewhat different, no swarming on the soil during pairing being observed. One species occurred on *Aeluropus*, but under different ecological conditions; others lived on the roots of leguminous plants.

[BOGDANOV-KAT'KOV (N. N.).] **Богданов-Катьков (Н. Н.).** Ed. **Pests and Diseases of Sweet Potatoes. Vol. I.** [*In Russian.*]—Demy 8vo, 242 pp., 126 figs., 29 maps, 3 col. pls., 29 refs. Moscow, Quarant. Adm., 1933. (With a Summary in English, pp. 212–216.)

This handbook, to which 6 authors have contributed, represents the first part of a projected series on pests and diseases of sweet potato (*Ipomoea batatas*) that occur in the Russian Union or might be introduced into it. It is almost entirely devoted to insects, only 15 pages dealing with diseases. Over 80 pages are devoted to notes on the morphology, geographical distribution, economic importance, bionomics and control of the pests of this plant that occur in the Russian Union, and over 60 to similar notes on those not yet recorded there. Preliminary keys are given for the determination of the chief pests in the stage in which they attack the plants. A small section (pp. 233–242) records the pests of sweet potato found in 1932 in the Ukraine (14 species) and the Caucasus (16 species), with brief notes on the seasonal occurrence of most of them and the character of the damage caused.

The cultivation of sweet potato has recently been started on a small scale in the North Caucasus and along the Black Sea Coast of Transcaucasia, as well as in southern Ukraine, eastern Uzbekistan and the Russian Far East, and it is planned to increase considerably the area under this crop. The literature on its pests in various countries is reviewed, and a systematic list is given of over 240. Some 50 species that have been found in the Russian Union are listed separately, of which 17 have not previously been recorded from this food-plant. In Transcaucasia, sweet potato is attacked by *Donacia* sp., the Elaterid,

*Compsolacon crenicollis*, Ménétr., and the Pterophorid, *Alucita pentadactyla*, L., which have not hitherto been recorded from any economic crop. *Aserica japonica*, Motsch., of which the authors consider *A. castanea*, Arrow, to be a synonym, has recently been found well established in Transcaucasia, the adults attacking the leaves of sweet potato and other cultivated plants. Attention is drawn to the fact that none of the pests that cause severe damage in other countries has been found in the Russian Union, and to the importance of establishing quarantines against some 30 species that might be imported from abroad and against 9 indigenous species. A list is given of 30 insects occurring on convolvulaceous plants in the Russian Union that might migrate to sweet potato.

Chemical, agricultural and biological control measures are briefly discussed, special importance being attached to agricultural methods. Autumn and spring ploughing are recommended to destroy the hibernating pupae of *Herse convolvuli*, L., the chief pest in the North Caucasus and Transcaucasia, from which 13 species of parasites have been reared in the Russian Union.

CHIAROMONTE (A.). **Considerazioni entomologiche sulla coltura delle piante oleaginose nella Somalia Italiana.** [Entomological Notes on the Cultivation of Oil-producing Plants in Italian Somaliland.]—*Agricoltura colon.* **28** no. 1 pp. 38–43. Florence, January 1934.

Notes are given on a number of insects observed on castor [*Ricinus communis*], gingelly [*Sesamum indicum*], sunflower [*Helianthus annuus*] and coconut in Italian Somaliland, of which the following are the more important pests: larvae of *Anomala* spp. on the roots of castor and *Sesamum*; the Noctuid, *Achaea catella*, Gn., and to a less extent, *Cyrtacanthacris tatarica*, L., which attack the leaves of castor; the Pyralid, *Antigastra catalaunalis*, Dup., which is very injurious on *Sesamum*; and *Heliothis obsoleta*, F., which feeds on the tender seeds of sunflower. Coconut is infested by *Aspidiotus destructor*, Sign., and the planted nuts are sometimes destroyed by *Termes classicus*, Sjöst.

Many parasites and predators are listed, a number of which have already been noticed from Italian Somaliland [*R.A.E.*, A **19** 504; **20** 393, 394; **21** 426, 584, 643]. Others include a fungus attacking *Empoasca facialis*, Jac.; a Braconid, *Clinocentrus* sp., parasitising the Tineid, *Acrocercops conflua*, Meyr.; and *Tachina fallax*, Mg., bred from the Geometrid, *Thalassodes digressa*, Wlk., all three hosts being minor pests of castor.

DELIASSUS (M.), BRICHET (J.), BALACHOWSKY (A.) & LEPIGRE (A.). **Les ennemis des cultures fruitières en Algérie et les moyens pratiques de les combattre.**—*Bibl. Colon Afr. N.* Med. 8vo, 235 pp., 137 figs. Algiers [1931].

This practical handbook for the use of fruit-growers in Algeria comprises separate chapters on the pests and diseases of *Citrus*, olives [*R.A.E.*, A **19** 534], seed and stone fruits, figs and dates, followed by bibliographies. The injurious insects are described and illustrated, and notes are given on their biology and control. A preface by L. Trabut deals with the organisation of economic entomology in the Colony [**21** 24].

ROMAN (E.). **Sur un Anobiide nuisible aux meubles.**—*Bull. Soc. linn. Lyon* (N.S.) **3** no. 2 pp. 27–28, 1 ref. Lyons, February 1934.

The Anobiid, *Oligomerus ptilinoides*, Woll., found attacking furniture in Lyons, was eradicated by injecting oil of mirbane (nitrobenzene) into the galleries and then stopping them with wax over a period of 3 years.

GRANDI (G.). **Introduzione in Italia di un Imenottero americano parassita della *Cydia molesta* Busck.**—*Italia agric.* **70** no. 11, reprint 6 pp., 1 fig. Rome, November 1933. [Recd. February 1934.]

In Italy, where it was not recorded before 1920 [*R.A.E.*, A **10** 81], *Cydia molesta*, Busck, causes considerable damage to peach. The author has advocated the collection of shoots infested by the larvae, and figures are given showing that some growers have found the cost of this measure to be only 10 per cent. of the value of the increased crop resulting from it. In June 1933, 600 cocoons of the Braconid parasite, *Macrocentrus ancylivora*, Roh., were imported from the United States and produced 331 females and 251 males at the laboratory at Bologna. Between 1st and 10th July, these were confined under gauze covers on infested peach trees in northern Italy. The number of available hosts was increased by the addition of further infested twigs. Adult parasites of the new generation emerged at the end of July and early in August.

BONFIGLIOLI (O.). **Nuove prove di lotta contro la cocciniglia grigia del pero.** [New Experiments in Control of the Grey Scale of Pear.]—*Note Fruttic.* **12** no. 2 pp. 27–30. Pistoia, February 1934.

In 1933, several proprietary tar distillates sprayed against *Epidiaspis* (*Diaspis*) *leperii*, Sign. (*piricola*, Del G.) on pear trees in Tuscany on 2nd March, and some of them also on 19th March, gave satisfactory results.

MELIS (A.). **Due lustri di lotta antidacica in Sardegna.** [A Decade of Work against the Olive Fly in Sardinia.]—*Note Fruttic.* **12** no. 2 pp. 31–39. Pistoia, February 1934.

In this reply to criticism by some Sardinian olive-growers of the Berlese method [*R.A.E.*, A **12** 557, etc.] of using bait-sprays against the olive fly [*Dacus oleae*, Gmel.], a series of instances are mentioned showing the efficiency of the method in Sardinia. It is undoubtedly effective in certain regions, such as Sardinia, Tuscany and Liguria, but in others, such as Calabria, it must be regarded as in the experimental stage.

[PETROVA (M.).] **Петрова (M.). The Apple Moth in Bulgaria and its Control.** [In Bulgarian.]—*Z. landw. VersSta. Bulg.* **5** no. 9–10 pp. 33–65, 11 figs., 21 refs. Sofia, 1933.

*Hyponomeuta padellus malinellus*, Zell., is widely distributed in Bulgaria and causes severe damage to apples. All stages are described, and a detailed account is given of its biology as observed by the author in the district of Sofia. The adults appear between 8th and 20th June

and are on the wing to the end of July, a few individuals occurring till mid-August. Pairing takes place 14 days after emergence. The eggs, the number of which under each protective cover [*cf. R.A.E., A 19 288*] varies from 15 to 70, hatch in a month, and the larvae remain under the covers for 9 months. They are active in spring for about 4 weeks, pupating between 25th May and 20th June. The economic importance of this Tineid is discussed, and a list is given of 14 parasites (of which 13 are Hymenoptera) that have been recorded from it in Bulgaria; the commonest are the Ichneumonids, *Pimpla alternans*, Grav., and *Chorinaeus cristator*, Grav., the Encyrtid, *Ageniaspis fuscicollis*, Dalm., and the Tachinid, *Discochaeta euonymellae*, Ratz., the adults of all of which are described.

Mechanical control measures recommended include collection of the hibernating larvae; removal in spring of infested leaves or of the silken nests containing larvae or pupae [*cf. 17 258*]; and the use of adhesive bands to prevent the larvae (which drop to the ground when overcrowded) from climbing up the trees. Information is given on various insecticides used in sprays against the larvae. In field tests, 100 per cent. mortality was obtained by 3 applications (on 21st April and 16th and 26th May) of Paris green (1 lb. to 100 gals. water and 2 lb. unslaked lime), 3 proprietary arsenicals or barium chloride (1.5 per cent.). In laboratory experiments with the four arsenicals, young larvae that had just emerged from the leaf-mines were killed in 8 hours and those 15–20 days old in 5 days. Sprays should therefore be applied a few days before the larvae emerge from the leaves.

SZALAS (J.). **Beitrag zur Biologie der Art *Phloeosinus thujae* Perris.** [*In Polish.*]—*Spraw. Kom. fizjogr.* **66** pp. 67–73, 3 figs., 14 refs. Cracow, 1932. (With a Summary in German.)

The Scolytid, *Phloeosinus thujae*, Perris, which is widely distributed throughout Central Europe, is recorded as infesting *Thuja occidentalis* in Poland, where it had hitherto only been known to attack juniper. The galleries it makes in the trees are described. In Poland it has one generation a year.

HERING (M.). **Minenstudien 14.** [Studies of Leaf-mining Insects, 14.]—*Z. PflKrankh.* **44** no. 2 pp. 49–70, 24 figs. Stuttgart, 1934.

This paper includes a key to and notes on insects mining the leaves of oak.

KRÜGER (—). **Erwiderung zu "Luzerneschädlinge" von Dr. Hans Lehmann, Zeitschrift für Pflanzenkrankheiten (Pflanzenpathologie) und Pflanzenschutz, Heft 11, S. 625, Jahrg. 1933.** [A Comment on Dr. H. Lehmann's Paper on "Lucerne Pests."]—*Z. PflKrankh.* **44** no. 2 pp. 92–94. Stuttgart, 1934.

The use of arsenicals against pests of lucerne [*R.A.E., A 22 4*] involves serious risk of poisoning cattle to which the plants are given as fodder. On 18th June 1931, a field of *Lotus corniculatus* near Landsberg a.W. was dusted with an arsenical against *Hypera* (*Phytonomus*) *variabilis*, Hbst. On 10th September, a herd of 35 cattle was pastured there for one day. All the animals showed symptoms of poisoning, and 3 died.

HAUPFLEISCH (K.). **Zwiebelmondfiegen-Larven an Kartoffeln.** [Bulb Fly Larvae in Potatoes.]—*Kranke Pflanze* **11** no. 1 pp. 5–6, 1 fig. Dresden, January 1934.

There are only a few records [*cf. R.A.E., A*, **8** 288] of infestation of potatoes by *Eumerus strigatus*, Fall. Such infestation, affecting large tubers and involving a 5 per cent. crop loss, has, however, occurred recently in Schleswig-Holstein, where up to 40 larvae were found in a tuber. As there were no large onion fields in the neighbourhood and the potatoes were planted where rye had followed a green manure crop, the Syrphid had probably been introduced with the seed potatoes.

PRELL (H.). **Ueber das Vorkommen der Milbenseuche in Sachsen.** [On the Occurrence of Acarine Disease of Bees in Saxony.]—*Arch. Bienenk.* **15** no. 1 pp. 37–45. Berlin, 1934.

Notes are given on the distribution of the mite [*Acarapis woodi*, Rennie] infesting bees in various localities in Saxony [*cf. R.A.E., A* **21** 307], where it was first recorded in 1927.

GIMINGHAM (C. T.). **The Male *Lecanium corni* Bouché.**—*Ent. mon. Mag.* **70** no. 837 pp. 41–42, 6 refs. London, February 1934.

Numerous male pupae of *Lecanium corni*, Bch., were found (together with many females) on the leaves and lower part of a young plant of yew (*Taxus baccata*) received from Surrey in May 1933. The male adults, which are briefly described, emerged at about 3 p.m. during 15th–20th May and died within 24 hours, many being caught by the sticky material on the leaves and branches. They flew only short distances, showing positive phototropism, and ignored the females. The male of this Coccid is apparently rare and does not seem to have been previously recorded from Britain [*R.A.E., A* **21** 554].

TURNBULL (J.). **New Methods of Spraying Fruit Trees.**—*J. Minist. Agric.* **40** no. 11 pp. 1040–1046. London, February 1934.

The improved methods suggested for spraying apple trees in Britain involve the application of a larger volume of liquid in the form of a driving spray, the object being to reduce the time taken to treat a given number of trees and the difficulty of obtaining a complete cover. The necessary equipment is briefly discussed.

BRITTAİN (W. H.) & PICKETT (A. D.). **Injurious Insects of Nova Scotia. Part I. Fruit Insects.**—*Bull. Dep. Agric. N.S.* no. 12 (revd), 123 pp., 29 figs., 40 pls. Halifax, N.S., 15th September 1933.

This revised edition of a bulletin already noticed [*R.A.E., A* **16** 444] contains much additional information, especially on control measures. This first part comprises the general account of insects, with notes on pests of fruit trees and small fruits.

BENNETT (C. W.). **Further Observations and Experiments with Mosaic Diseases of Raspberries, Blackberries and Dewberries.**—*Tech. Bull. Mich. agric. Exp. Sta.* no. 125, 32 pp., 6 figs., 20 refs. East Lansing, Mich., August 1932. [Recd. February 1934.]

The mosaic diseases affecting *Rubus* spp. in Michigan are distinguished as red-raspberry mosaic, the symptoms of which range from

slight leaf mottling ("mild mosaic") to severe necrosis, and yellow mosaic [cf. *R.A.E.*, A 15 667; 19 495]. The symptoms of these, separately and in combination, in different varieties and their relation to temperature are discussed. The only known method of transmission is by Aphid vectors, the most important being *Amphorophora rubi*, Kalt. [cf. 18 539; etc.], which occurs from early June until after the beginning of the frosts; it has been found in cages in this State as late as 6th December. It prefers certain varieties of red raspberries, and in these the diseases spread rapidly; dewberries and blackberries appear to be less attractive, but it readily infects them with either form of mosaic. The feeding of one infected individual of this Aphid on young shoots of raspberries produced infection in 70 per cent. of tests with red-raspberry mosaic and in 43 per cent. with yellow mosaic; 100 per cent. infection with the former was produced by the feeding of 5 Aphids, and with the latter by 50 but not by 20. Both nymphs and adults transmitted the diseases [cf. 15 283]. They became infected with the viruses of yellow and red-raspberry mosaics after feeding on diseased raspberry for minimum periods of 2 and 12 hours and transmitted them to healthy plants within 48 and 12 hours, respectively. Those that had fed for less than 20 hours (and most of those that had fed for longer periods) on plants infected with red-raspberry mosaic appeared to lose their infectivity after feeding for 48 hours on a healthy plant. It seems probable that *A. rubi* is only a mechanical vector of these diseases.

Inconclusive results were obtained with *Aphis rubicola*, Oestl. (*rubiphila*, Patch) [cf. 15 668; 18 71]. *Amphorophora sensoriata*, Mason, which is sometimes the most abundant Aphid, though its numbers fluctuate considerably, transmitted red-raspberry mosaic to 7 out of 15 plants in 7–12 days when forced to feed on the tips of the canes, but owing to its habit of attacking the woody stems it is probably a much less important vector than *A. rubi*. *Amphorophora rubicola*, Oestl., which is relatively rare in southern Michigan, transmitted red-raspberry mosaic to 4 out of 10 plants. As it feeds on the leaves and the younger parts of the stem, it may be an important vector where it is abundant.

**MCDANIEL (E. I.). Important Leaf Feeding and Gall Making Insects infesting Michigan's Deciduous Trees and Shrubs.**—*Spec. Bull. Mich. agric. Exp. Sta.* no. 243, 70 pp., 76 figs., 13 refs. East Lansing, Mich., September 1933. [Recd. February 1934.]

Notes are given on the bionomics and control of a representative selection of the numerous insects that attack the foliage of shade trees in Michigan and of a few insects and mites that form galls on them.

**HUTSON (R.). Insect Pests of Stone Fruits in Michigan.**—*Spec. Bull. Mich. agric. Exp. Sta.* no. 244, 40 pp., 37 figs. East Lansing, Mich., September 1933. [Recd. February 1934.]

Short notes are given on the bionomics and control of the chief insects and mites injurious to peach, plum or cherry in Michigan.

HUCKETT (H. C.). **The Spray Value of Nicotine Supplements for Aphids.**—*Tech. Bull. N.Y. St. agric. Exp. Sta.* no. 210, 20 pp., 6 figs., 9 refs. Geneva, N.Y., July 1933. [Recd. February 1934.]

The author describes the technique and gives the results of greenhouse tests on the effect of adding various proprietary materials as activators to sprays of 40 per cent. nicotine sulphate against Aphids. Increased mortality was obtained in all tests with Penetrol, which was used at a strength of 1 : 200, and with two other miscible mineral oils (1 : 100) and three soaps (1 : 150); a miscible pine-tar oil (1 : 100) was less satisfactory, and a powdered gum (lignin pitch) (1 : 150) was usually ineffective. Sprays containing Bordeaux mixture (4 : 6 : 50) instead of water were generally much more efficient, but the effect of the activators in these was usually less marked. The control obtained with the nicotine sulphate at half strength (1 : 1,600) was variable and generally inadequate, and at 1 : 3,200 it was never satisfactory. At half strength, however, it gave a high mortality (over 90 per cent.) of *Aphis gossypii*, Glov., and *Macrosiphum (Illinoia) solanifolii*, Ashm., with the addition of soap or mineral oil and in Bordeaux sprays even without their addition, and of *Myzus persicae*, Sulz., in Bordeaux sprays with the addition of mineral oil. Over 80 per cent. control of *Brevicoryne brassicae*, L., was only obtained with sprays at full strength (1 : 800) with the addition of an activator.

CRAWFORD (A. W.). *Glypta rufiscutellaris* Cresson, an Ichneumonid Larval Parasite of the Oriental Fruit Moth.—*Tech. Bull. N.Y. St. agric. Exp. Sta.* no. 217, 29 pp., 12 figs., 8 refs. Geneva, N.Y., September 1933. [Recd. February 1934.]

*Glypta rufiscutellaris*, Cress., all stages of which are described, occurs in western New York as an internal parasite of the larvae of *Cydia (Grapholitha) molesta*, Busck. Its economic importance in the United States is discussed. In April 1930, it parasitised 74·84 per cent. of larvae of *Epiblema strenuana*, Wlk. (ragweed borer) [cf. *R.A.E.*, A 19 204]. In 1931, this host was scarce, and the percentage of parasitism of *C. molesta* by the Ichneumonid was unusually high (7·96). The maximum recorded was 14·09 in 1928, and the average over 5 years was 5·05, each of the three generations of the host being parasitised. A large percentage of the first parasites that emerged in 1932 (on 12th–16th May) survived until larvae of *C. molesta* were available (on 5th June) in the absence of *E. strenuana*. No other host of this species was observed.

Three generations were reared in the laboratory. When fed on sugar and water, adults of the third lived the longest, the average adult life of all generations being 28·9 days for females and 19·0 for males. The adults were positively phototropic, and pairing in cages was stimulated by irradiation with light of longer wave lengths (0·076 $\mu$ ). The pre-oviposition period was 2–6 days. Parthenogenesis occurred after the usual pre-oviposition period, the progeny being male. The optimum conditions for oviposition were bright sunlight and a temperature of 70–80°F, but it could occur within a range of 60–90°F. The eggs were laid in the body-cavity of the host larvae, and the presence of a small amount of larval frass appeared to incite oviposition. As many as 5 eggs were dissected from one larva, but these were probably the result of oviposition by 2 or 3 females. Parasitised larvae showed no

immediate sign of injury. Few parasites survived from eggs laid in very young (one-day-old) or old (third-instar) larvae. At 75–80°F., the eggs hatched in 36–44 hours, the four larval instars totalled about 2 weeks and pupation occurred 3–4 days after the larvae had shed the emptied skin of the host.

The winter is passed in the larval stage within the cocoon; the prepupal stage is reached in mid-winter, and pupation occurs in April. The overwintered adults emerge in early May, and those of the summer generations in early July, early August and late September. In *Epiblema*, there is one generation and a partial second.

DANIEL (D. M.), COX (J.) & CRAWFORD (A. [W.]). **Biological Control of the Oriental Fruit Moth.**—*Bull. N.Y. St. agric. Exp. Sta.* no. 635, 27 pp., 11 figs. Geneva, N.Y., September 1933. [Recd. February 1934.]

Summarised data are given on the distribution of *Cydia* (*Grapholitha*) *molesta*, Busck, in New York [cf. *R.A.E.*, A 20 422]. The number of larvae per acre in peach orchards throughout Niagara County is estimated to have been 9,468 in 1928, 18,900 in 1929 and 8,288 in 1932. The decrease since 1929 is attributed largely to parasites. Those reared in the State, in addition to 20 species previously recorded [20 405], include *Macrocentrus laspeyresiae*, Mues. [20 596], *Pimpla* (*Epiurus*) *indagatrix*, Cress., *Ephialtes* (*Calliephialtes*) *benefactor*, Cush. [19 578], and *E. (C.) grapholithae*, Cress. The most effective was *M. ancylivora*, Roh., of which 110 colonies have been liberated in western New York. Parasitism by this Braconid in Niagara County in 1932 amounted to 25 per cent., the total parasitism being 40·21 per cent. It was reared partly on *Ancylis comptana*, Fröl., in a wooden cage over growing strawberries. In winter, when there was no food available for this host, *C. molesta* only was used; the eggs were laid in battery jars (7 × 5 ins.), 100–200 moths being admitted to each, on cotton batting covered with muslin and moistened with dilute fruit juice, to which a few peach leaves were added when available. The jars were laid in an incubator kept at 75–80°F. [cf. 21 329] and 65–75 per cent. relative humidity, with the bottom towards a 30-watt carbon filament lamp covered with red cellophane, and the moths were transferred to a new jar every morning. The larvae, which began to hatch out after 3 days, were kept at 80°F. and room humidity and fed (preferably on quinces, as these rot less readily than apples) for 10–14 days. Those to be parasitised were first allowed to bore for a few hours into fresh peach twigs with the leaves cut off, so that they could not readily escape the ovipositing female parasites. The winter supply is ensured by keeping several thousand twigs standing in water at 32–34°F. and by forcing young trees to early growth in the greenhouse. The parasitised larvae fed for 2–3 days in the twigs and then completed their feeding on fruit. In winter, they were forced into hibernation by alternate exposure for 2 days to 32–40 and then to 70–80°F. until they had spun their cocoons, when they were stored at outside temperatures till spring.

In some orchards, appreciable numbers of larvae of *C. molesta* were found in apples; in one sample, from trees bordering on a plot of peach, 38 of this species were found to 160 of the codling moth [*C. pomonella*, L.]. The very heavy (100 per cent.) infestation of quince [20 422] in Niagara County is apparently due to the fact that the larvae rarely burrow into the twigs, as they do on peach, but penetrate into the fruit, where they cannot be reached by parasites. Liberation of *Ascogaster*

*carpocapsae*, Vier., which oviposits in the eggs [20 466], failed to reduce infestation of quince, perhaps because the females were attracted to eggs of *C. pomonella* in neighbouring apple orchards.

HARTZELL (F. Z.) & PARROTT (P. J.). **Tar Distillate Emulsions for the Control of the Rosy Aphid and other Fruit Insects.**—*Bull. N.Y. St. agric. Exp. Sta.* no. 636, 29 pp., 10 refs. Geneva, N.Y., October 1933. [Recd. February 1934.]

This paper summarises work carried out during the past 5 years in New York in which a number of foreign and American brands of tar distillate emulsions were analysed and tested in commercial orchards [*R.A.E.*, A 21 340; etc.]. A home-made emulsion proved to be no cheaper than commercial brands, which are therefore recommended. The addition of petroleum oil [*cf.* 21 490, etc.], to enhance the durability of the emulsion and render it effective against a wider range of insects, gave conflicting results; severe injury was caused by combined sprays in 1931 [20 520], but none resulted in the spring of 1933 from the application to apple at concentrations of 5 and  $7\frac{1}{2}$  per cent. of two preparations containing equal quantities of tar oil and lubricating oil. As an emulsion of more than 6 per cent. lubricating oil alone injured the trees, particularly on light soils, and tar oils are apparently no less dangerous, mixtures of these should be used with caution.

In 1933, commercial control of *Anuraphis roseus*, Bak. (rosy apple aphid), frequent and heavy outbreaks of which necessitate the annual application of control measures, was obtained with tar distillate washes containing as little as 3–5 or sometimes only 2 per cent. of the concentrated emulsion. This treatment may therefore be used during the dormant period, preferably in spring, where difficulty is experienced in treating large orchards with nicotine sulphate and lime-sulphur during the short delayed dormant period [*cf.* 20 219]. It was generally even more successful against *Aphis pomi*, DeG. (green apple aphid), the eggs of which seem to occur usually on more exposed positions on the bark. It gave fairly good control on apple of *Lepidosaphes ulmi*, L., after two successive annual applications, but gave no conclusive results against *Aspidiotus perniciosus*, Comst. [*cf.* 20 322] and was apparently unsuccessful (in 5–10 per cent. concentrations) against *Heterocordylus malinus*, Reut., and *Lygidea mendax*, Reut.; the varying numbers of these Capsids on different trees, however, makes it difficult to assess the value of measures against them. Concentrations of 5 per cent. are effective against light infestations of *Eucosma (Spilonota) ocellana*, Schiff. (eye-spotted bud moth) on apple, though  $7\frac{1}{2}$  per cent. is sometimes necessary. Sprays of 4 and 6 per cent. applied against *Myzus cerasi*, L., caused no injury to cherry and were about equally effective, generally destroying 95–100 per cent. of the eggs. Tar distillates proved highly toxic to adults and eggs of *Psylla (Psyllia) pyricola*, Först., on pear without injury to the trees, but not more so than lubricating oils, which are cheaper.

Concentrations of not more than  $7\frac{1}{2}$  per cent. may be safely applied to apple early in spring before the tips of the more advanced buds have become grey, and not more than 5 per cent. to cherry while the buds are still brown. The concentrations recommended for orchard use are respectively 5 and 4 per cent. Directions are given for the use of tar distillate emulsions, with a table showing the optimum strengths for use against individual insects.

HARTZELL (F. Z.). **Tar Distillate Emulsions for the Control of the Black Cherry Aphid.**—*Bull. N.Y. St. agric. Exp. Sta.* no. 637, 23 pp., 14 refs. Geneva, N.Y., November 1933. [Recd. February 1934.]

*Myzus cerasi*, F. (black cherry aphid) causes stickiness and smutting of the fruit of sweet cherries and sometimes stunts the growth of young trees in nurseries in New York. The commercial varieties of sour cherries are not usually severely attacked. Difficulty has been experienced in securing commercial control with a contact insecticide, and the removal of infested spurs before the stem-mothers begin to reproduce may spoil the shape of the tree if practised for a number of years and may not adequately protect the fruit. Field tests in 1932 and 1933, a detailed account of which is given [cf. preceding abstract], indicate that the spraying season may now be extended into the spring by treating part of the orchard with a tar distillate wash containing 4 per cent. of the stock emulsion while the buds are in the swollen-brown stage and the temperature not lower than 45°F., and the remainder with nicotine sulphate just after the buds burst.

**Division of Entomology.**—*Rep. N.Y. St. agric. Exp. Sta.* **52** (1932–33) pp. 54–71. Geneva, N.Y., 1934.

Much of the work against injurious insects in New York State during 1932–33 has been already noticed [see preceding abstracts and *R.A.E.*, A **21** 461, etc.]. Sprays of 2 per cent. summer petroleum oil and nicotine gave 84 per cent. control of *Contarinia pyrivora*, Riley, on pear; oil alone or lime-sulphur with or without nicotine proved less effective [cf. *R.A.E.*, A **19** 353, 403]. Relatively few adults of this Cecidomyiid emerged from soil treated with crude naphthalene. Naphthalene appears to be the most promising of the cheaper substitutes for compounds of mercury [cf. **20** 528, etc.] in the control of the cabbage root maggot [*Phorbia brassicae*, Bch.] on cabbage seedlings. The application of mercurous chloride or an oxide of mercury to the seeds before planting gave somewhat inferior control to that obtained from applications to the surface of the soil, but the difference may be offset by the saving in time and labour.

Considerable damage to elms, particularly *Ulmus glabra*, was caused by *Gossyparia spuria*, Mod., and the sawfly, *Fenusa* (*Kaliosysphinga*) *ulmi*, Sund. (elm leaf-miner) was also abundant. Both may be easily controlled by the application of nicotine and soap against the young larvae. This spray is also effective against *Diaspis visci*, Schr. (*carueli*, Targ.) (juniper scale), as are oil sprays applied during early spring before growth starts, though these may seriously injure the foliage on weak or heavily infested trees. Lead arsenate applied early in the spring when the moths are emerging has reduced damage on spruce heavily infested with *Argyroplote* (*Olethreutes*) *abietana*, Fern., which is difficult to control, as the young larvae enter the needles, which they web together [cf. **17** 29]. Larvae of the first brood of *Diprion* (*Neodiprion*) *pinetum*, Norton (Abbott's pine sawfly) practically defoliated white pine [*Pinus strobus*] in some areas. There was only a partial second brood (which caused little or no injury) of this sawfly and of *Galerucella luteola*, Müll. (*xanthomelaena*, Schr.) (elm leaf beetle).

Cryolite and related compounds and arsenical substitutes for lead arsenate sprays effectively protected cherries against *Rhagoletis cingulata*, Lw., and calcium arsenate was as effective as lead arsenate against *R. pomonella*, Walsh, which was more prevalent on apple than in the

previous year [cf. 21 317]. Promising results in the control of *Tachypterellus quadrigibbus*, Say (apple curculio) were obtained by applying kerosene emulsion to the sod against the larvae, pupae and adults in the apples that dropped in June or against hibernating adults [cf. 21 337, etc.]. *Conotrachelus nenuphar*, Hbst. (plum curculio) continues to be a major pest of apple in the Hudson Valley, particularly in orchards just coming into bearing. Lead arsenate gave better results as a spray than as a dust, and its effectiveness was increased by the addition of an adhesive such as fish-oil. Calcium arsenate compared with it favourably. Partial control of *Lygidea mendax*, Reut. (apple red bug) is obtained with 6 per cent. lubricating oil emulsions.

The European corn-borer [*Pyrausta nubilalis*, Hb.] was a rather serious pest of sweet maize, and the two-brooded strain caused some damage to beets and lima beans [*Phaseolus lunatus*], some fields of which had as much as 15 or 20 per cent. of the pods infested. In western New York, this pest is seldom of great importance in intensive market garden sections where the maize remnants are disposed of immediately after harvest. *Heliothis obsoleta*, F., was very destructive on Long Island, as all the sweet maize planted in May and June came into silk during August and all fields became seriously infested. Injury to the cob of strains having husks with comparatively long, tight tips was less by about one-third than to those with shorter or loose tips. Treatment of the ears with insecticides or mechanical appliances as soon as they came into silk was ineffective owing to the subsequent development of the ears and silks. Experiments on Long Island showed that beans for succession cropping may be sown up to mid-May with a reasonable assurance of avoiding commercial injury by the Mexican bean beetle [*Epilachna corrupta*, Muls.].

WISECUP (C. B.) & MILLER (R. L.). **A Study of Insect Populations on Celery in the Sanford, Florida, District.**—*Fla Ent.* 17 no. 4 pp. 53–62, 4 figs. Gainesville, Fla., December 1933.

The numbers of insects, etc., of different orders or families swept with the net from celery in Florida during the seasons 1929–30 are shown in tables. Most of them were of little economic importance. *Phlyctaenia rubigalis*, Gn. (celery leaf-tier), the most serious pest [R.A.E., A 21 41], never formed more than 0.25 per cent. of the entire population. The Capsid, *Halticus citri*, Ashm., caused serious damage in the spring of 1929. Red mites [*Tetranychus telarius*, L.] were most numerous during the dry season (winter), and Aphids during the cool, dry period of autumn, when parasites and *Empusa* were least common. *Syngrapha (Autographa) falcifera*, Kby., and *Phytometra (A.) brassicae*, Riley, were present throughout the season, reaching injurious numbers in late spring; when they become very abundant, they are generally controlled by disease [cf. *loc. cit.*] and parasites.

BAKER (H.). **The Obscure Scale on the Pecan and its Control.**—*Circ. U.S. Dep. Agric.* no. 295, 19 pp., 6 figs., 9 refs. Washington, D.C., December 1933.

An account is given of investigations carried out in Louisiana during 1929–32 on the biology and control of *Chrysomphalus obscurus*, Comst., which is present throughout a large part of the pecan-growing area in the United States. The scales occur on the woody parts of the trees, or occasionally on the leaf-stems. Infestation spreads outward and upward along the branches, causing the death of those up to 3 ins. in

diameter and weakening the trees, which are thus predisposed to attack by other insects and by disease. The stages are briefly described. Oviposition begins between mid-May and early June, and hatching occurs within a few days; both eggs and crawlers are numerous until mid-July, but few are present by the beginning of August, though scattered individuals may be found until early October. There is only one generation a year. From the 150 eggs laid by a single female, about 100 larvae become successfully established beneath old scales or fairly near the parent. In January and early February 1931, 84.44 per cent. of all the individuals found alive were females; 62.63 per cent. of these and 5.72 per cent. of the males had settled under old scales. This habit may explain the difficulty normally experienced in controlling this Coccid [cf. R.A.E., A 19 750; 20 216]. On recently infested trees, however, where old scales are scarce, relatively low concentrations of oil may sometimes give satisfactory control. The sexes may be distinguished about mid-October, the males hibernating in the second larval stage and the females before the second moult. Development is resumed late in winter, and pairing occurs about April.

Parasites, which include the Aphelinids, *Prospaltella fuscipennis*, Gir., *P. berlessei*, How., *Physcus varicornis*, How., and *Ablerus clisio-campae*, Ashm. (here given in order of their importance), killed about 14 per cent. of *C. obscurus* in two orchards in 1931 and about 21 per cent. in 1932. The fungi, *Myriangium duriaei* and *Sphaerostilbe aurantiicola* infested 13.28 per cent. of the scales collected in three orchards in January and early February 1931. These natural enemies may make control measures unnecessary in some areas. *Hemisarcoptes* sp. attacks ovipositing females and the offspring sheltering beneath them, but it appears too late in the season to be of maximum value. Other mites, of the genera *Cheyletia*, *Atomus* and *Allothrombium*, and Coccinellids have been observed, but do not appear to be of great importance.

Lubricating oil emulsions gave good control (over 94 per cent.) at concentrations of 6-8 per cent. oil, but sometimes injured the trees when applied at more than 4 per cent. At this latter strength, they gave slightly better control (about 67 per cent.) than miscible oils (1:15). Liquid lime-sulphur was not satisfactory even at a dilution of 1:5. Applications were equally effective if made at the beginning, middle or end of the dormant period, but least injury was caused when the trees were strictly dormant. The method by which the several oils employed were emulsified did not appear to affect their efficiency. As almost the same degree of control was obtained with all the oils used in the lubricating oil emulsions, any oil within the limits of the specifications generally recommended for dormant application should be satisfactory under most conditions. In limited tests, oils of somewhat lower viscosity and higher volatility appeared nearly as effective as the others and slightly less injurious to the trees. Injury to the treated trees appeared to depend more on their weak condition or the effect of drought or neglect than on any characteristic of the oil. Summer oils applied just before hatching did not have any lasting deterrent effect on the wandering larvae or influence the development of those that settled.

Lubricating oil emulsion (4 per cent. on lightly infested or weak trees, or 5 per cent. on trees heavily infested but otherwise healthy) should be applied to all parts of severely infested small or moderate-sized trees and to the lower three-quarters of other trees during the strictly dormant period (after December).

FRIEND (W. H.). *Citrus Orchard Management in the Lower Rio Grande Valley*.—*Circ. Texas agric. Exp. Sta.* no. 67, 56 pp., 31 figs., 16 refs. College Station, Tex., March 1933.

In the course of this bulletin, brief notes are given (pp. 40–49) by S. W. Clark (with references to the literature) on the appearance, biology and control of the Coccids and other pests of major and minor importance on *Citrus* in the Lower Rio Grande Valley of Texas.

LINSLEY (E. G.). **A European Longicorn new to California (Coleoptera Cerambycidae)**.—*Pan-Pacif. Ent.* 9 no. 4 p. 170. San Francisco, Calif., 1933.

A brief description is given of the South European Cerambycid, *Leptidea brevipennis*, Muls., which was discovered in 1932 and 1933 in several localities in California, on *Quercus agrifolia* and Persian walnut (*Juglans regia*), on which it may possibly have been introduced.

ROBINSON (R. H.) & HATCH (M. B.). **The Removal of Lead and Arsenic Spray Residues from Apples and Pears**.—*Sta. Bull. Oregon agric. Exp. Sta.* no. 317, 15 pp., 6 refs. Corvallis, Ore., September 1933. [Recd. February 1934.]

In a commercial lead arsenate used in spraying apples and pears, the ratio of lead to arsenic ( $\text{As}_2\text{O}_3$ ) was 2.15 : 1.0. As the United States tolerance per lb. of fruit in 1933 [*cf. R.A.E.*, A 22 158, etc.] was 0.01 gr. arsenic and 0.02 gr. lead, which may be reduced to 0.014 gr. for 1934, it is thus necessary to remove a greater quantity of lead than of arsenic. Of various solvents tested in the laboratory, however, none dissolved a greater proportion of the lead, and on fruit, owing to the presence of wax and oil, the proportion of lead dissolved was actually much less; apparently the acid and alkaline solvents used changed the arsenic to a form that was easily removed, whereas some of the lead was precipitated in the form of insoluble compounds and was not removed during the short time that the fruit remained in the solution. Both lead and arsenic may be easily removed with hydrochloric acid and certain alkaline solvents if they are used before excessive amounts of wax are formed.

On particularly waxy apples washed in commercial machines, the ratio of lead to arsenic was 3 : 1. The best results were obtained with hydrochloric acid (1.5 per cent.) used for 32 minutes at 110°F. and sodium silicate (9 per cent.) for 60 minutes at 120°F., which left an average arsenic residue of 0.0051 and 0.0058 gr. and a lead residue of 0.012 and 0.013 gr. per lb. respectively. The addition to the hydrochloric acid of ferric nitrate, which was especially effective in the laboratory, seemed to decrease the solubility of both lead and arsenic. Sodium silicate acts as a slight degumming agent, and may be more effective than hydrochloric acid for cleaning very waxy fruit without causing injury. Comparisons of various types of washing machines showed that any system of underneath brushes aided cleaning, especially when some of them were oscillating. The addition of 10 or 20 per cent. sawdust slightly increased the efficiency of the solvent solutions, but not enough to warrant recommendation for general use. In flotation tests, 1.5 per cent. hydrochloric acid with 1 per cent. of a degumming agent, Vatsol [*cf. 21 475*], at 70°F. reduced the lead residue on heavily sprayed apples to 0.024 gr. or less after 2½ minutes and 0.016

gr. after 5 minutes. This mixture also gave good results in a washing machine, especially at 100°F., but the excessive foaming caused by the Vatsol necessitated the addition of an anti-foam compound. This, being a wax solvent, may have also aided the cleaning. It is necessary, however, to determine the effect of this solution on recently harvested fruit, to find a more practical and odourless anti-foam agent, and to determine the modifications that will be necessary under packing-house conditions. Washings with sodium silicate followed by hydrochloric acid reduced the lead well below the 0.014 gr. tolerance in all tests, but it is necessary to rinse the fruit thoroughly after the first process, and over-exposure to the solvents at high temperatures must be avoided. Until storage tests have been carried out to determine conditions in which scorching and other injury to recently harvested fruit may occur, care must be taken in using any of the suggested processes, especially in washing susceptible varieties of fruit unprotected by natural wax.

SCARAMUZZA (L. C.). **Grass Worms attacking Sugar Cane in Cuba.**—*Proc. 3rd Conf. Asoc. Téc. Azuc. Cuba 1929* pp. 110–115, 9 refs. Havana [1930]. [Recd. February 1934.]

Serious injury may be caused to sugar-cane in Cuba when it is growing rapidly during the rainy season by Noctuid larvae, which defoliate young ratoons and plant cane. Though the plants soon recover, their growth may be stunted if the rains are late. The most important species is *Laphygma frugiperda*, S. & A., which was found from late June to August 1928 and during July–September 1929. The larvae perforate the leaves of the top whorl and pupate in the soil, the adults, which are attracted to lights, emerging within 1–3 weeks. The eggs, which are laid in masses of 300–400 on vegetation, the sides of buildings, etc., and covered with protective scales, hatch in 2–3 days. Breeding continues throughout the year. Natural enemies observed comprised various birds, the Braconid, *Chelonus texanus*, Cress. [cf. 20 694]; the Eulophid, *Euplectrus platyhyphenae*, How. [cf. 15 632]; and the Tachinids, *Archytas piliventris*, Wulp, *Gonia texensis*, Reinch., and *Zenillia blanda*, O. S.

The Noctuid next in importance on sugar-cane is *Mocis repanda*, F., which usually feeds more on the edges of the leaves than *L. frugiperda*, with which it is sometimes associated. The adults are attracted to lights, but not in such great numbers as *Laphygma*. *Cirphis latiuscula*, H.-S. [cf. 14 473] was observed in 1926 and 1927, and larvae of the Hesperiid, *Perichares corydon*, F., which pupate within leaf-folds, were common in cane fields in July and August 1928, when they were also particularly injurious to potted cane in the plant-house.

Young sugar-cane may be protected from the Noctuid larvae by hand-collection and the application of a bait of 50 lb. wheat bran, 1 lb. Paris green and 2 U.S. gals. molasses.

LOFTIN (U. C.). **The P.O.J. Canes and Insect Damage.**—*Proc. 4th Conf. Asoc. Téc. Azuc. Cuba 1930* pp. 52–58, 2 refs. Havana [1931]. [Recd. February 1934.]

Observations in Cuba up to 1930 show that, though the more vigorous growth of the P.O.J. varieties of sugar-cane makes them more attractive to *Diatraea saccharalis*, F., the heavier infestation appears to be outweighed by the increased yield [cf. R.A.E., A 22 149]. The same quality makes them better able to withstand injury by insects

attacking the roots [cf. **18** 165]. Infestation by stalk mealybugs (*Trionymus sacchari*, Ckll., and *Pseudococcus boninsis*, Kuw.) appears to be lightest on varieties with a more open growth, including some of the P.O.J. ones, possibly because they provide a suitable environment for the entomophthorous fungus, *Aspergillus*. As the P.O.J. varieties are resistant to mosaic, infestation by *Aphis maidis*, Fitch [cf. **22** 150] is relatively unimportant.

BARRETO (B. T.). **The Mealybugs of Sugar Cane.**—*Proc. 5th Conf. Asoc. Téc. Azuc. Cuba 1931* pp. 132–134. Havana [1932]. [Recd. February 1934.]

*Trionymus (Pseudococcus) sacchari*, Ckll., *P. boninsis*, Kuw., and *Ripersia radicola*, Morr., occur in large numbers on sugar-cane in Cuba, where they may kill tender shoots in fields planted with infested seed cane or poorly cultivated. Control measures recommended are: immersion of infested seed cane in hot or cold water [cf. *R.A.E.*, A **18** 165]; clean cultivation; ploughing and harrowing infested fields at least 4 times at intervals before replanting; and the use of a leguminous cover crop [cf. **15** 446].

PLANK (H. K.). **Damage in Left-over Cane caused by the Sugar Cane Moth Stalkborer, *Diatraea saccharalis* Fabr.**—*Proc. 5th Conf. Asoc. Téc. Azuc. Cuba 1931* pp. 135–137. Havana [1932]. [Recd. February 1934.]

Investigations were carried out in Cuba in 1926–29 to determine the extent of the loss caused by *Diatraea saccharalis*, F., to sugar-cane that is not cut regularly every year. In samples of unirrigated cane of an average age of 9 and 21·3 months respectively, the percentage infestations of the harvestable stalks averaged 59·8 and 88·7 and of the joints 13·03 and 14·45, with percentage field losses of 1·07 and 30·98. For irrigated cane aged 8·4 and 18·1 months, the corresponding figures were 89·7 and 96·6, 23·32 and 43·37, and 3·91 and 41·32.

SCARAMUZZA (L. C.). **Prospects for the Control of the Sugar Cane Moth Stalkborer (*Diatraea saccharalis* Fab.) in Cuba by Means of Natural Enemies.**—*Proc. 6th Conf. Asoc. Téc. Azuc. Cuba 1932* pp. 87–93, 11 refs. Havana [1933]. [Recd. February 1934.]

The various attempts that have been made since 1914 to export *Lixophaga diatraeae*, Tns., from Cuba for the control of *Diatraea saccharalis*, F., are briefly reviewed, and an account is given of studies carried out in Cuba early in 1931 that showed the economic practicability of rearing it artificially for liberation in fields where natural parasitism is low. The technique was similar to that previously noticed [*R.A.E.*, A **21** 662; etc.]. The Tachinid failed to develop in *Laphygma frugiperda*, S. & A., *Calpodus ethlius*, Cram., or *Utetheisa venusta*, Dal. As many as 5 maggots were reared in one large larva of *D. lineolata*, Wlk., but as the early development of this species is as slow as that of *D. saccharalis* and it could not be collected from the field without destroying the maize on which it feeds, it did not prove a suitable laboratory host. In *Diatraea* larvae already parasitised, the inoculated maggot was killed. An average of about 30–50 and a maximum of 113 maggots suitable for inoculation were obtained from a single fly. As many as 80 per cent. of the puparia for liberation were

obtained by means of artificial inoculation. In Cuba, *L. diatraeae* is occasionally attacked by a Diapriid hyperparasite, *Trichopria cubensis*, Font., which develops in the puparium of the fly.

Parasitism of *D. saccharalis* by *Microdus* (*Bassus*) *stigmaterus*, Cress., in *Paspalum millegrana* was sometimes 10 per cent., which is probably higher than in sugar-cane [cf. 21 410]. As it amounted to 38.8 and 28.5 per cent. of two samples from rice in 1932, benefit might be derived from planting rice near cane fields.

Arrangements are being made for the introduction of *Ipobracon rimac*, Wolcott, which occurs in north-western Argentina and Peru [21 506]. It should be particularly useful in the higher and drier areas of Cuba, where conditions are not favourable for the indigenous species.

BUSCK (A.). **Microlepidoptera of Cuba.**—*Ent. amer.* **13** (1933) no. 4 pp. 151–202, 7 pls. Lancaster, Pa, 7th February 1934.

Among the new species described is the Elachistid, *Donacivola saccharella*, gen. et sp. n., which mines in the leaf-bases of sugar-cane in Cuba. When full-grown, the larvae leave the mines and pupate under dark-brown cocoons. This moth is at present effectively controlled by parasites.

**Jamaica : Proclamation under Section 2 (1) of the Customs (Import Prohibition) Law 1916 (Law 23 of 1916).**—5 pp. typescript. Kingston, 13th January 1934.

The importation into Jamaica of all fruits and vegetables (except dried or processed fruits and vegetables, grains, seeds, Irish potatoes and onions, including any species of *Allium*) is prohibited, except when accompanied by a Government certificate stating that the consignment is free from pests, etc., and that *Ceratitis capitata*, Wied., does not exist in the country of origin. All produce imported under this Proclamation is liable to inspection, and 7 days notice must be given of its arrival. Inspectors are empowered to order any treatment to be applied to imported produce with the object of destroying pests or disease, or to order its destruction at the expense of the importer.

HEMPEL (A.). **O combate á broca do café por meio da vespa de Uganda.** [Work against the Coffee Borer with the Uganda Parasite.]—*Bol. Agric. Zootec. Vet. Minas Gerais* **6** no. 9 pp. 551–555, 1 fig. Belo Horizonte, September 1933. [Recd. February 1934.]

*Prorops nasuta*, Wtstn., was imported from Uganda into Brazil against *Stephanoderes hampei*, Ferr., in 1929 [*R.A.E.*, A **18** 460] and is now established in several plantations. It enters the berry through the hole made by the beetle. It kills the latter, feeds on the young larvae and deposits one egg in each of the others and in the pupae. Oviposition is at the rate of one egg daily or one every two days, according to the amount of food available for the ovipositing parasite. No alternative host of this Bethyloid has been found. Coffee berries containing parasitised borers should be collected in boxes or tins, which should be placed where required under the coffee bushes or among their branches, shielded against rain and direct sunshine. If artificial breeding is

advisable, adults allowed to emerge from infested berries in a room are caught on the windows and given access to a further supply of infested berries.

MONTE (O.). **Um novo parasita da broca da cana** (*Diatraea saccharalis*, F.) e considerações sobre esta broca. [A new Parasite of the Cane Borer and Notes on the Borer.]—*Bol. Agric. Zootec. Vet. Minas Gerais* **6** no. 9 pp. 559–563, 3 figs. Belo Horizonte, September 1933. [Recd. February 1934.]

The author records the rearing of *Metagonistylum minense*, Tns. [R.A.E., A **22** 107] from *Diatraea saccharalis*, F., in sugar-cane in Brazil, and gives notes from the literature on the control of the latter.

MONTE (O.). **Pragas e moléstias do chá.** [Pests and Diseases of Tea.]—*Bol. Agric. Zootec. Vet. Minas Gerais* **6** no. 10 pp. 597–600, 1 fig. Belo Horizonte, October 1933. [Recd. February 1934.]

Tea is being planted in the State of Minas Geraes, Brazil. The leaves are attacked by the adults of the Melolonthid, *Symmela mutabilis*, Erichs., the Dynastid, *Cyclocephala variabilis*, Burm., and the Rutelid, *Geniates barbatus*, Kby. The Melolonthid is the most injurious. Very brief descriptions of these Lamellicorns are given.

BITANCOURT (A.), DA FONSECA (J. P.) & AUTUORI (M.). **Manual de Citricultura. II Parte. Doenças, Pragas e Tratamentos.**—Demy 8vo, 212 pp., 183 figs. S. Paulo, Chacaras e Quintaes, 1933. Price 10 Milreis.

The first section of this volume, by Bitancourt, is devoted to the diseases of *Citrus* in Brazil. The second, by da Fonseca and Autuori (pp. 83–171), deals with the bionomics of the various pests, the chief of which have already been noticed [R.A.E., A **20** 403]. Notes on their natural enemies and control are included. The third part, by all three authors, contains information on the preparation and use of sprays and dusts and equipment for their application.

WILLE (J.). **Ueber einige Vorrats- und Speicherschädlinge in Peru.** [On some Stored Product and Warehouse Pests in Peru.]—*Mitt. Ges. Vorratsschutz* **10** no. 1 pp. 4–8, 4 refs. Berlin, January 1934.

In Peru, stored wheat, maize and rice are commonly attacked by *Sitotroga cerealella*, Ol., which also occasionally infests beans and peas. Coleoptera found in stored cereals are *Calandra oryzae*, L., *C. zeae-mais*, Motsch., *Rhizopertha dominica*, F., *Silvanus (Oryzaephilus) surinamensis*, L., *Laemophloeus ferrugineus*, Steph., and, as a secondary pest, *Tribolium confusum*, Duv. *Ephestia elutella*, Hb., and *Plodia interpunctella*, Hb., have been observed in wheat and maize that have been stored for a long period. A Scolytid determined by H. Eggers as *Pagiocerus frontalis*, F. (*rimosus*, Eichh.) attacked maize cobs in well ventilated stores in the Moquegua valley at a relative humidity of 50 per cent. At 25°C. [77°F.], its life-cycle was completed in 40–42 days. It is very sensitive to moisture and avoids damp maize. The broods soon died on the coast, where the relative humidity was 90 per cent.

*Spermophagus subfasciatus*, Boh., is very injurious to stored beans and peas. External injury is caused to them by Tortricid caterpillars that have attacked the pods in the field. These also attack the pods of the tara shrub (*Caesalpinia tinctoria*), and the adults often emerge from heaps stacked at tanneries; severely infested pods are refused by the tanners.

Cotton-seed is attacked by the tobacco beetle, *Lasioderma serricorne*, F. [R.A.E., A 20 6] and, to a less degree, by *Pyroderces rileyi*, Wlsm. *Sitodrepa panicea*, L., infests all bakers' goods. Against *Dorcatoma bibliophagum*, Magalh., a serious pest of books, fumigation with carbon bisulphide (1 volume per mille) at 23°C. [73.4°F.] for 24 hours in chests proved effective, no fresh larval feeding being noticed after 18 months. *Corcyra cephalonica*, Stn., infested locally manufactured chocolate.

Pests introduced with stored products from the field include *Cydia* (*Carpocapsa*) *pomonella*, L., in apples and *Anastrepha fraterculus*, Wied., in various fruits [cf. 22 146]. Sweet potato is infested by *Euscepes batatae*, Waterh., which, however, does not normally attack varieties having red flesh, and potato by *Premnotrypes solani*, Pierce, and, less commonly, *Rhigopsidius tucumanus*, Heller, and *Trypopermion latithorax*, Pierce [cf. 18 322]; the importation of these vegetables from Peru into the United States is forbidden in consequence. Potatoes are also attacked by *Phthorimaea operculella*, Zell., and *P. (Gnorimoschema) melanoplintha*, Meyr., of which Busck has found *G. tuberosella*, Busck [19 367] to be a synonym.

Adults and larvae of *Rhizopertha dominica* were found boring in the roots of *Lonchocarpus* sp., apparently unaffected by their poisonous qualities, and a generation of the beetle was reared in them.

ZELLER (S. M.). **Crinkle Disease of Strawberry.**—*Sta. Bull. agric. Exp. Sta. Oregon* no. 319, 14 pp., 4 figs., 7 refs. Corvallis, Ore., October 1933. [Recd. February 1934.]

In the course of this paper, further experiments [cf. R.A.E., A 21 665] on the transmission of crinkle disease of strawberry in Oregon are described. Single immature individuals of *Capitophorus potentillae*, Wlk. (*Myzus fragaefolii*, Kkll.) are capable of transmitting the disease, and more than 6 will almost certainly produce 100 per cent. infection. It is not known whether the observed spread of infection in the field is due to the flight of winged adults or to the distribution of the immature Aphids by some mechanical agency. Preliminary experiments indicate that *Philaenus leucophthalmus*, L. (*spumarius*, auct.), *Tetranychus telarius*, L., and *Trialeurodes vaporariorum*, Westw., are probably not vectors.

GIBSON (A.). **Recent Advances in Applied Entomology in Canada.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 45–63. Paris, 1933.

The development of the federal entomological service in Canada is outlined from the appointment of the first official entomologist in 1884 till 1931. Brief notes are given on the major insect pests that have entered Canada since about 1910 in spite of preventive regulations, which are described. Data obtained in annual surveys on the incidence of dominant economic insect pests have been interpreted in relation to climate and weather, so that it is now possible effectively to forecast outbreaks. The most significant study has had for its object the design of a cultural practice and series of crop rotations for prairie conditions that will control the major pests, notably wireworms [cf.

R.A.E., A 21 479, etc.]. Brief notes are given on each of the insects studied and on the insect parasites introduced into Canada during the past 10 years, mainly for the biological control of *Cydia (Laspeyresia) molesta*, Busck, on peach, *Pyrausta nubilalis*, Hb., on maize and *Cephus cinctus*, Nort., on wheat.

HERFS (A.). **Untersuchungen zur Oekologie und Physiologie von *Anthrenus fasciatus* Herbst.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 295–302. Paris, 1933.

In feeding experiments with larvae of *Anthrenus fasciatus*, Hbst., the various substances offered were stained with Rhodamin Red B, which persisted in the excreta and stained the larvae also. Horn was the preferred food, but dried bodies of animals, dried insects, skins, leather, hair and wool textiles were all readily eaten. In extreme hunger, cotton fabrics [cf. R.A.E., A 16 202], silk and some artificial silks, sponges, dry cheese, etc., were eaten. Normal development, however, was possible only on dead animal matter such as the bodies of insects and substances such as wool, hair or horn that contain keratin.

The developmental stages were shortest at 35°C. [95°F.], the egg-stage lasting 8 days, the larval 70 for females and 64 for males, and the pupal 10. At 30°C. [86°F.], the number of moults was smallest (averaging 6.8 and 6.2 for female and male respectively). Even an apparently slight unfavourable change of food increased the moults up to an observed maximum of 29. At 20°C. [68°F.], there was a mortality of 88 per cent., which sometimes reached 100 per cent. during the pupal stage. At 40°C. [104°F.], the eggs failed to hatch; if the humidity was low, all larvae or pupae also died, but if it was raised to 50–60 per cent., about 16–18 per cent. reached the adult stage. At 25–30°C. [77–86°F.], larval mortality was only 5 per cent., and it fell to zero at 35°C.

*A. fasciatus* is naturally restricted to dry conditions. The duration of the various developmental stages was observed at two extremes of relative humidity (95–100 and about 35 per cent.). Larval mortality was 10 and 5 per cent. respectively. The egg-stage lasted 10 days under both conditions, but the high humidity shortened larval and pupal development and reduced the number of moults and the body-weight of the adults.

Continuous exposure to an electric lamp at 35°C. and about 40 per cent. relative humidity increased the duration of development by about 49 per cent. for females and 46 for males.

*A. fasciatus* is a very serious pest of all wool textiles, particularly of horse-hair and carpets. As a pest of horse-hair, it may possibly carry anthrax. Eulan [cf. 20 235; 21 324] prevents attack by *A. fasciatus* as well as by clothes moths.

KENNEDY (C. H.). **Some fundamental Aspects of Insect Parasitism.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 407–419. Paris, 1933.

The author discusses parasitism from a biological standpoint and defines it as equivalent to regressive evolution, a variable having a lower and upper limit and a modulus of change. The lower limit is the change from a food-supply that is discontinuous in space, the acquisition of which requires locomotor and sensory organs, to one that is continuous in space and is ample for the needs of the organism. The

upper limit is the complete loss of all organs required for the acquisition of discontinuous food, leaving only what is necessary for simple absorption of liquid food through the body wall. The modulus of change is the action of natural selection on fortuitous mutations towards the elimination of the sensory and locomotor organs as needless expenders of energy.

ALFIERI (A.). **Sur une nouvelle maladie du dattier.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 479–482, 2 pls., 4 refs. Paris, 1933.

Serious injury to date-palms reported from Siwa, in the Libyan desert of Egypt, in 1926 and 1927 was found to be due to the Tropicuid, *Ommatissus binotatus* var. *libycus*, Bergevin. The nymphs were at first mistaken for adults of the Issid, *Asarcopus palmarum*, Horv., a species that in Egypt has been observed only in Cairo [*R.A.E.*, **A** 9 537], but attacks date also in California [**16** 69]. Nicotine sulphate sprays applied in December, when only a few adults remained on the trees, proved ineffective. An investigation in 1929 showed that palms growing in poor soil were most heavily infested. Soon after the formation of the fruit in May, an even deposit of sweet white secretions produced by the young nymphs is found covering the entire lower surface of the leaflets. As the nymphs grow, the deposit becomes thicker and a kind of honey-dew formed from it drips from leaf to leaf. This honey-dew finally ferments and becomes coated with dust, and a fungus forms on it that eventually causes asphyxia of the tissues. By August the whole tree except the trunk and topmost branches is dirty and sticky, bearing only atrophied fruits, and by September the leaves are obviously withered. The nymphs continue to feed from May till September. The adults appear in October and leave the infested trees to oviposit in healthy tissue on other date palms. The eggs, which are described, are laid singly, deeply embedded along the mid-rib of the lower surface of the leaflets. They hatch early in April, and applications of nicotine sulphate in May would probably destroy the young nymphs.

AUDANT (A.). **La chenille du cotonnier** (*Alabama argillacea* Hübner) **en Haiti.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 483–487. Paris, 1933.

*Alabama argillacea*, Hb., causes serious injury to cotton in Haiti, where whole plantations are frequently defoliated by the larvae in early summer. In a rainy region, the plants may put out several successive series of leaves to be each in turn destroyed by fresh generations of larvae, of which there may be as many as six, and still produce a crop at the end of 5–6 months, although the bolls will be poor and small. In dry regions, however, the plants are so much weakened by the first attack that they entirely fail to produce a crop. The larvae feed for about 2 weeks, causing most damage in the last few days, and then pupate, in rolled leaves and possibly also in the soil. After 4–5 days, the adult moths appear, and pairing and oviposition follow immediately. The total life-cycle lasts about 20 days. When the dry season begins in November, the larvae disappear and the eggs are almost all destroyed by parasites. It has been suggested that the moths, which are very strong fliers, migrate to some part of America where growing cotton offers more favourable conditions, or that larvae hatching from a few eggs laid in December survive and maintain the

annual cycle. More probably some larvae enter the soil about December and pass the period January–April there in the pupal stage, the adults emerging after the heavy rains in April or early May.

Calcium arsenate and lime, either as a dust (1 : 10) or as a spray (1 : 2–3 lb. in 50 U.S. gals. water) may be applied, if necessary, when the plants come into flower. Earlier in the season, it is better to let the larvae continue to feed, as a certain reduction of the leaf surface may even be beneficial. During this period, parasites such as *Trichogramma minutum*, Riley, and *Brachymeria (Chalcis) incerta*, Cress., reduce the numbers of the host considerably. The pupae may be destroyed by hand in small fields. Clean cultivation and thorough pruning of the plants after harvest are strongly recommended, particularly in rainy regions.

CHIAROMONTE (A.). **Considerazioni entomologiche sulle principali colture della Somalia Italiana.** [Entomological Notes on the chief Crops in Italian Somaliland.]—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 495–514, 3 refs. Paris, 1933.

Most of the pests mentioned in this paper have already been noticed [*R.A.E.*, A **19** 504 ; **20** 393 ; **21** 584 ; **22** 11, 77, 172]. Besides cotton [**20** 393], two other fibre plants, kapok and *Hibiscus cannabinus*, are grown in Italian Somaliland, the latter only as a trap-plant for cotton pests. Kapok is attacked by *Dysdercus cardinalis*, Gerst., *Argyroplote leucotreta*, Meyr., *Ferrisiana (Ferrisia) virgata*, Ckll., and larvae of *Anomala* spp.

WILSON (G. F.). **Symptomatic Detection of Plant Pests : its Importance in the Training of Agricultural, Horticultural and Forestry Students.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 519–528, 3 figs. Paris, 1933.

The author considers that a knowledge of the type of damage caused by insect pests is of more value to students of agriculture, horticulture and forestry than a necessarily incomplete training in systematic entomology. The methods recommended for their instruction are briefly outlined.

HAEUSSLER (G. J.). **The Oriental Fruit Moth, *Grapholitha molesta* (Busck), and its Parasites in France and Italy.**—*Congr. int. Ent. Paris 1932* **5** 2 Trav. pp. 533–537. Paris, 1933.

In France, *Cydia (Grapholitha) molesta*, Busck, appears to be confined to the extreme south-east (Alpes Maritimes and Var) [*cf. R.A.E.*, A **19** 85] ; in Italy, it occurs throughout Liguria and in some orchards in Tuscany, Emilia and Piedmont. The food-plants comprise twigs and fruits of peach, fruits of pear, quince and apple, and twigs of almond and apricot. Although, judging from the amount of injury in the areas of heaviest infestation, the moth is quite as abundant as in similar areas in the United States, it is not considered to be of as much economic importance. Infestations are chiefly centred in districts where only early ripening varieties of peach are grown, but if it spreads to districts where later varieties of peaches or other fruits are available, it will probably prove much more injurious. In August at Fréjus, 55 per cent. of the entire crop of a variety of peach that was then ripe was injured by larvae ; 58 per cent. of those found were *C. molesta*, 30

per cent. *C. (Carpocapsa) pomonella*, L., and 12 per cent. *Anarsia lineatella*, Zell. In an outdoor insectary in Nice during 1931, adults of *C. molesta* from overwintered cocoons continued to emerge from 26th February until 3rd June, with an interval during cold weather in March. Data are recorded on the length of the stages of each generation. The average life-cycle for non-hibernating individuals of all broods was 36.1 days; 25 per cent. of the third and all the fourth generation hibernated.

Although more than 30 species of parasites were found to attack *C. molesta* in France and Italy, the average percentage parasitism of larvae in twigs of peach and other fruit trees was only 2.4 in 1930 and 1.8 in 1931, and the highest observed in 1931 was 5.6–6 (in two localities in France and one in Italy). Only one parasite, *Trichogramma euproctidis*, Gir., develops entirely within the egg of the host. A Braconid, *Ascogaster quadridentata*, Wesm., which oviposits in the eggs and develops within the larvae, was common. Of cocoons exposed in strips of corrugated paper in numerous localities, 23.15 per cent. in France and 20.88 per cent. in Italy were attacked by parasites, especially *Pimpla (Itoplectis) alternans*, Grav., *P. (Ephialtes) examinator*, F., *Dibrachys affinis*, Masi, *Hockeria bispinosa*, F., *Hemiteles areator*, Panz., and *Eurytoma appendigaster*, Swed.

DE LÉPINEY (J.). **Revision sommaire du comportement de *Schistocerca gregaria* Forsk., ph. *gregaria*, dans les lieux d'habitat temporaire.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 573–584, 14 refs. Paris, 1933.

This is a summary of recent studies on the behaviour of hoppers of *Schistocerca gregaria*, Forsk., some of which have already been noticed [*R.A.E.*, A 18 184, 449; 19 705, 733].

The behaviour of adults while not flying is almost identical with that of hoppers. The direction of flight is not determined by topographic details or by the position of the sun. The locusts show no apparent reaction to wind, which consequently does not determine the direction of their flight but merely influences it mechanically. A tendency to fly against the wind [*cf.* 17 538] occurs only when the locust takes off; during the flight, the air current will always be from front to rear, independently of wind.

GARAVANI (G.) & PAOLI (G.). **La lotta contro le cavallette (*Dociostaurus maroccanus* Thnb.) in Provincia di Roma nel 1932.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 627–632, 1 fig. Paris, 1933.

The area in Italy infested by *Dociostaurus maroccanus*, Thnb., during the outbreak that began in 1928 extends along the coast from the Tiber to Terracino.

Control was at first carried out by spraying hoppers with undiluted crude petroleum, but this was found uneconomical and replaced by emulsions of cresosol [*cf.* *R.A.E.*, A 21 124]. The strengths required to kill last-instar hoppers and adults respectively were 6–10 and 18 per cent., and the cost at the latter concentration was about 2s. [at par] per acre as compared with 4s. 8d. for the petroleum. Sodium arsenite in 1.5–2 per cent. solutions costs only about 5d.–6½d. per acre, but was not widely used owing to numerous cases of poisoning of domestic animals, which seldom eat plants sprayed with cresosol and suffer no ill effects even when they do so.

When the supplies of cresosol were temporarily exhausted, a somewhat similar material containing a higher percentage of soap was used, but proved rather more expensive. In addition to the usual sprayers, powerful motor sprayers were used with success.

Trenches and poisoned baits were employed as supplementary methods. Only about 5–10 per cent. of the locusts remained after the campaign, and these were exterminated by poisoned baits during their flights and egg-laying. Practically no damage was caused to cultivated plants, but pastures suffered severely either from locusts or from scorching by the insecticides.

RÉGNIER (R.). **Contribution à l'étude du rôle des insectes dans la propagation du chancre des peupliers.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 645–650, 4 refs. Paris, 1933.

Studies of canker, one of the most serious diseases of black and cottonwood poplars in France, have shown that the starting point of infection is frequently, though not necessarily, an injury due to insect attack. On young twigs, such injury may be caused by the oviposition punctures of Jassids, such as *Idiocerus scurra*, Germ., and *I. populi*, L., or the sucking of Jassids, Cercopids, such as *Aphrophora spumaria*, L. (*alni*, Fall.) and *A. salicis*, DeG., or Aphids, of which the commonest is *Pterocomma* (*Chaitophorus*) *populeum*, Kalt. Galls are formed in the shoots by the Tortricid, *Gypsonoma aceriana*, Dup. [*cf. R.A.E.*, A 17 60] and in the twigs and branches by the Lamiid, *Saperda* (*Compsidia*) *populnea*, L. [*cf. 8* 356]. The Aegeriids, *Sciapteron tabaniforme*, Rott., and *Aegeria vespiformis*, L., attack the young shoots and lower branches, generally ovipositing in pruning scars. The penetration of the canker infection is aided by larvae that bore deeply in the trunks and larger branches of older trees, including those of the Aegeriid, *Trochilium apiforme*, Cl., and the Cossids, *Cossus cossus*, L., and *Zeuzera pyrina*, L., the eggs of which are often laid in canker wounds, and *Saperda* (*Anaerea*) *carcharias*, L. [*cf. 9* 171, 471]. The cankerous secretions also attract *Mycetobia pallipes*, Mg., the larvae of which attack the wood. This Anisopodid is sometimes associated with certain Mycetophilids and *Anisopus* (*Rhyphus*) *fenestralis*, Scop., which promote the penetration of the canker by working in the jellified portion of the tissues.

RÉGNIER (R.). **Des effets de la succion d'*Aphrophora salicis* De Geer sur les bois de Salicinées.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 651–654, 1 ref. Paris, 1933.

Willows and poplars growing in marshy valleys in France are injured by the sucking of *Aphrophora salicis*, DeG., and on drier ground more frequently by *A. spumaria*, L. (*alni*, Fall.), which also lives on species of alder, ash and even pine. The bionomics of these two Cercopids are similar, and both may be found on the same tree. As they hop rather than fly, they only gradually reach the upper parts of the tree, so that young trees and the lower parts of older ones are chiefly attacked. On trees that are regularly pruned, the upper part is seldom or never reached. Damage to uncultivated trees is caused by both adults and nymphs and continues from May to October, but in cultivated plantations it is due almost exclusively to the nymphs, which are not present after the end of June. The protective froth formed by them and the method of suction through the bark are discussed, as well as the reaction

to attack of different species of *Populus* and *Salix*, which may possibly give some indication of the relative susceptibility of the former to canker [cf. preceding paper].

**RICHARDS (O. W.). Some recent Work in England on Pests of Stored Products.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 655–658. Paris, 1933.

The recent increase in importance of insect pests of stored products is briefly discussed, and some account is given of the research on them in progress in England.

**THOMPSON (W. R.). Economic Entomology and Agricultural Practice.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 659–665. Paris, 1933.

The author discusses the possible modifications of agricultural practice that may result from the present economic crisis and their effect upon applied entomology.

**UVAROV (B. P.). Physiological Basis of Applied Entomology.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 667–678. Paris, 1933.

The intimate connection between the problems of practical entomology and the physiology of insects is illustrated by a number of examples, which show that physiology can no longer be ignored by economic entomologists. The urgent need is for fundamental research to elucidate the processes in the individual and the species that make it a pest. The immense scope of the work calls for very careful selection of the problems to be studied, and it is suggested that the best results would be obtained if a detailed study of a particular insect were first made in its natural habitat by applying exact quantitative methods for the evaluation of the environmental factors, and the data so obtained were then subjected to careful analysis in the laboratory. This can be carried out by planning a series of experiments under strictly controlled conditions, the various factors and their intensity and combinations being chosen with due regard to those that the insect is likely to encounter in nature. The analysis of the experimental data should not stop at purely empirical inferences, but aim at revealing the most intimate physiological processes of the life-history.

[**VUKASOVIĆ (P.).**] **VOUKASSOVITCH (P.). Sur une invasion de la cochenille : *Lecanium corni* dans les prunelaies yougoslaves. Etudes préliminaires de la cochenille et des moyens de lutte.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 679–691, 12 refs. Paris, 1933.

Much of the information given on the bionomics and control of *Lecanium corni*, Bch., on plum in Bosnia and Serbia has already been noticed [*R.A.E.*, A 18 432, 605 ; 19 132, 322, 323, 519.] The immature females hibernate in the second instar on twigs or branches, generally on the under side, or on the trunk, although on the parts nearest the ground they are rare. They do not appear to seek shelter under lichens. They become active in sunny situations on warm days. In March or April, they travel to the tips of the twigs, where they begin to feed. After the second moult, they reach maturity at the end of May or beginning of June and soon begin to oviposit, generally laying more than 1,000 eggs each, which hatch in about 10 days.

The young larvae are usually found on the lower surface of the leaves, where they remain during the summer, growing very little, moulting once and moving frequently. In autumn, they establish themselves in their hibernation quarters. Normally, therefore, there is only one generation a year. In a mild autumn, when some of the leaves failed to drop from the trees, a few larvae remained on them actively feeding throughout the winter, and a small percentage of these completed development and matured in the spring.

Reproduction is parthenogenetic, but males were continuously present in small numbers, being more numerous toward the end of the outbreak. They were especially common when the insect was artificially bred on *Cyperus papyrus*, where conditions were unfavourable. In the field, the adults emerged from pupae about the end of April or beginning of May.

Extremes of humidity had no effect on the incubation period. In a completely dry atmosphere, 80 per cent. of the newly hatched larvae died. High humidity was favourable to them. They were able to survive freezing for 48 hours, and sudden variations in temperature also failed to affect them. After the excessively cold and dry winter of 1927-28, infestation was much more severe than in previous years.

The newly hatched larvae did not move faster than  $\frac{1}{2}$  inch a minute. As they were not able to resist starvation for more than 3 days, the maximum annual advance of the scale, apart from carriage by wind, cannot be more than about 65 yds.

**BATHELLIER (J.). Dégâts causés par les termites d'Indochine, aux végétaux vivants et aux bois d'oeuvre et les moyens d'y remédier.—**  
*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 747-750. Paris, 1933.

A general account is given of the injury caused by termites to timber used for building and furniture in Indo-China. Living plant tissue generally remains immune, even when dead wood on living trees is destroyed, but it is attacked by *Coptotermes curvignathus*, Hlmg. [cf. *R.A.E.*, A 15 361; 20 11]. *Eutermes malangensis*, Haviland, which normally occurs only near the level of the soil, destroyed the case and stops of the organ in Saigon Cathedral, although it had been erected on a high platform of masonry. Other termites attacking timber are species that do not construct termitaria, belonging to the genera *Calotermes* (*Cryptotermes*), *Coptotermes* and *Leucotermes*. Hard woods such as ebony, teak, etc., are resistant to attack, whereas most soft woods are highly susceptible. *Dipterocarpus alatus*, a very hard wood much used for furniture and carpentry, is, however, severely attacked, and camphor [*Cinnamomum camphora*] and a species of *Artocarpus* used for making images are immune although soft.

**GRADOJEVIĆ (M.). Les ennemis de *Picea omorica* Pančić conifère endémique de la Yougo-Slavie.—***Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 789-790, 1 pl. Paris, 1933.

A preliminary note is given on the enemies of *Picea omorica*, a rare spruce only found in Yugoslavia. Examination of felled or injured trees showed secondary attack by *Ips* (*Pityogenes*) *chalcographus*, L., *I. typographus*, L., *Polygraphus poligraphus*, L., and *Dendroctonus micans*, Kug. Insects occurring sporadically included *Pityophthorus pityographus*, Ratz., *Xyloterus lineatus*, Ol., *Crypturgus cinereus*, Hbst., the Cerambycids, *Semanotus undatus*, L., and *Molorchus*

(*Caenoptera*) *minor*, L., and the Lamiids, *Monochamus galloprovincialis*, Ol., and *Acanthocinus griseus*, F. *Dioryctria abietella*, Schiff., has been reared from infested cones. Pupae of *Lymantria monacha*, L., and eggs of *Porthetria* (L.) *dispar*, L., have been found on the bark of the trunks. *Chermes abietis*, L., which is very common on *P. excelsa* in Jugoslavia, has never been observed on *P. omorica*.

KALSHOVEN (L. G. E.). **Problems of Forest Entomology in the Netherlands East Indies.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 801–805, 4 refs. Paris, 1933.

This is a review of pests attacking teak and other forest trees in the Netherlands Indies, which have already been noticed [*R.A.E.*, A 14 521; 17 473; 18 286, 654; 21 186].

DE LÉPINEY (J.). **Le rôle de la Direction des Eaux et Forêts du Maroc et de l'Institut Scientifique Chérifien dans la lutte biologique entreprise contre *Lymantria dispar* à l'aide de *Schedius kuwanae*.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 807–812, 3 refs. Paris, 1933.

Published information on the introduction of the egg-parasite, *Ooencyrtus* (*Schedius*) *kuwanae*, How., into Morocco against *Porthetria* (*Lymantria*) *dispar*, L., a pest of cork oak, is briefly summarised [*cf. R.A.E.*, A 18 85, etc.]. By 1930, its establishment was considered complete. The area defoliated by the moth was reduced from an average of about 96 sq. miles up to 1929 to less than 5 sq. miles for the years 1930–32. Of the decrease in its numbers, about 20 per cent. was due to *O. kuwanae*, about 70 per cent. to destruction of the egg-masses by *Trogoderma versicolor*, Creutz., and *Tenebroides maroccanus*, Reitt., and part of the remaining 10 per cent. to other parasites [*cf. 16 315*].

CROS (A.). **Dégâts commis dans les ruches par les larves des méloés.**—*Congr. int. Ent. Paris 1932* 5 2 Trav. pp. 841–845. Paris, 1933.

The author gives from the literature a brief generalised life-history of beetles of the genus *Meloë*. The eggs, of which one female may lay several thousands, are deposited in the soil. The larvae climb on various herbaceous plants, where they hide in the flowers. When a bee alights on the flower, they attach themselves to its body and are carried back to the hive. Each larva takes sole possession of a cell and feeds on the egg. Later it invades neighbouring cells, where it devours the bee larvae present, and after several moults, transforms into a pseudo-pupa, in which stage it may remain either a short time or several years. A large proportion of the larvae, however, attach themselves to other insects visiting the flowers. Although at first sight it would appear that the adult bees are not directly harmed by these larvae, injury by *M. cavensis*, Petagna, and *M. variegatus*, Don., has been recorded from Cyrenaica [10 618]. In Algeria, however, where *M. cavensis* is common, no complaints of such injury have been received. Larvae of other species, such as *M. proscarabeus*, L., *M. foveolatus*, Guér., and *M. tucci*, Rossi, the heads of which are differently constructed, cannot cause direct injury.

Until further knowledge is available, bee-keepers are recommended to be on their guard against Meloid larvae in general and particularly against *M. cavensis* and *M. variegatus*.

HARGREAVES (H.). **Report of the Government Entomologist for 1932.**  
 —*Rep. Dep. Agric. Uganda 1932* pt. 2 pp. 50–54. Entebbe,  
 1933. [Recd. February 1934.]

*Platyedra gossypiella*, Saund. (pink bollworm) spread southwards from the Gulu district during 1932 [cf. *R.A.E.*, A **21** 302]; a few of the larvae were parasitised by *Microbracon kirkpatricki*, Wlkn. Towards the end of the picking season, the total damage by it was estimated at only about 10 per cent. of the cotton bolls, whereas that due to boll-rots associated with injury by cotton stainers [*Dysdercus*] was 50 per cent. *Argyroplote leucotreta*, Meyr., had apparently disappeared from areas that had been infested by *P. gossypiella* in 1931. The food-plants of the latter included okra (*Hibiscus esculentus*), which was slightly infested. Cotton growing in shallow, dry hill-side soil was more severely infested by *Empoasca facialis*, Jac. [cf. *loc. cit.*] and by *Helopeltis* than that growing in richer, damp soil. In one district, June-sown cotton showed injury by *Empoasca* and *Helopeltis* during December, whereas August-sown cotton growing within 60 yards was free from both pests; the crop was 3.3 bolls per plant, as compared with 6.9 from the uninfested ones. It is probable that some factor such as rainfall distribution or cultivation restricted root development in the June-sown plants, thus rendering them susceptible to infestation. Characters are given distinguishing the lesions caused by *Helopeltis* and by angular leaf-spot (*Bacterium malvacearum*), which had previously been confused [cf. **22** 78]. *Helopeltis* is probably primarily a forest insect, and its food-plants are varied but always succulent. Its prevalence on sweet potato in one area suggested that increased infestation of cotton may have been due to the extension of sweet potato cultivation. Work was continued on *Lygus vosseleri*, Popp., which reduced the cotton yield by damaging the young bolls. An experiment showed that the injury it causes to the vegetative parts of the plants results in loss of fruits, less primary, and more secondary, branching. Another Capsid, *Deraeocoris* sp., which was also found on cotton, was predacious on Aphids.

Coffee pests on which work is in progress comprise *Antestia lineaticollis*, Stål, *A. faceta*, Germ., the Tingid, *Habrochila placida*, Horv., the Capsid, *Volumnus obscurus*, Popp. (which damages the flowers [cf. **16** 313] in the same manner as *Lygus simonyi*, Reut.), *Stephanoderes [hampei]*, Ferr.] and *Dirphya [princeps]*, Jord.].

Insects found on ground-nut included the Pentatomid, *Piezodorus pallescens*, Germ., the Galerucid, *Luperodes quaternus*, Fairm., *Tortrix dinota*, Meyr., *Maruca testulalis*, Geyer, *Prodenia litura*, F., and *Aphis laburni*, Kalt. (the vector of rosette disease), which was attacked by a Hymenopterous parasite and Syrphid predators. In observations of ground-nuts growing in the drained part of a swamp and in a higher area with poor soil, an earlier and more severe attack of rosette disease occurred in the higher situation, where the effect of an early dry period (late in May) was marked.

A preliminary study was made of the ecology of *Cosmopolites [sordidus]*, Germ.] in abandoned and cultivated banana gardens. Old weevil workings were abundant in the abandoned area, but the adults were practically absent and young suckers were uninjured, perhaps owing to the presence of nests of small ants that were not uncommon under the outer layers of old pseudo-stems. In the cultivated area, larvae and adults were found in the plants, and predatory Histerids were present in decaying cut pseudo-stems.

ZOLK (K.). **Verwendung des Obstbaumkarbolineums zu Frühjahrsbespritzungen in Estland.** [The Use of Fruit Tree Carbolineum in Spring Spray Treatments in Estonia. (*In Estonian.*)]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 24, 8 pp., 2 figs., 12 refs.

**Rentabilität der Obstbaumbespritzungen in Estland.** [The Profit resulting from spraying Fruit Trees in Estonia. (*In Estonian.*)]—*Op. cit.* no. 25, 8 pp., 1 ref. Tartu, 1933. (With Summaries in German.)

An emulsion of shale oil of local manufacture that was extensively used in Estonia for spraying fruit trees in the spring of 1932 was found to be less stable than five foreign tar distillates but not inferior to some other brands. It compared satisfactorily in field experiments with various tar distillates tested against *Psylla mali*, Schm., in a severely infested apple orchard.

The second paper deals with the cost in Estonia of sprays for the control of orchard pests. The trees are generally treated in spring, shortly before the tips of the leaves appear, with shale-oil emulsion (1 : 9) at the rate of  $10\frac{1}{2}$  pints each on trees 25–30 years old. This is followed by three applications of a spray of Bordeaux mixture containing 3 lb. calcium arsenate to 100 gals., the first (of about 9 pints to a tree) at the pink-bud stage and the second and third (of about  $10\frac{1}{2}$  pints each) at petal-fall and 2–3 weeks later. The increased profit resulting from these four treatments is estimated at about ten times their total cost, assuming that in a regularly sprayed orchard an apple tree yields some 140 lb. of sound fruit, whereas 25 per cent. of the fruit on unsprayed trees is destroyed by pests and diseases and only 33.6 per cent. of the harvested crop is of full market value.

ZOLK (K.). **Der Frostspanner (*Cheimatobia brumata* L.) und Leimringe.** [The Winter Moth and Adhesive Bands. (*In Estonian.*)]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 27, 13 pp., 9 figs., 1 graph. Tartu, 1933. (With a Summary in German.)

The following is taken from the summary : The injury caused by *Cheimatobia brumata*, L., in Estonia has recently increased. The larvae hatch out in the first half of May and pupate in June. Observations in 1928–32 showed that the first male adults emerge in late September or at the beginning of October [*cf. R.A.E., A 22 53*] and the females 4–6 days later ; the peak of the flight is reached 7–10 days after the appearance of the males, which sometimes occur alone as late as the beginning of November. They are more active on warm days and do not fly at 0°C. [32°F.].

Adhesive bands are recommended for control, since tar distillate sprays fail to kill all the eggs, and it is difficult to spray the upper branches. Notes are given on the results of laboratory tests of the viscosity, resistance to high temperatures, etc., of four proprietary adhesives. In the orchard, one of these applied in the autumn of 1932 was still effective in the following spring.

ZOLK (K.). **Apfelwickler (*Cydia pomonella*, L.) und einiges über seine Bekämpfung.** [The Codling Moth and Notes on its Control. (*In Estonian.*)]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 28, 15 pp., 1 map, 6 figs. Tartu, 1933. (With a Summary in German.)

The following is taken from the author's summary : *Cydia pomonella*, L., is common in Estonia, especially in the central and southern

parts of the country, where orchards are more numerous. In 1933, the flight period lasted from 16th June to 1st July, the peak occurring on 18th June, whereas during the rather cool summer of 1928 it lasted from 9th June to 8th July, the peak being reached between 22nd June and 1st July. The moths live about 8 days. Six females placed in a muslin bag laid 22 eggs, of which 19 were deposited on the upper surface of the leaves, 2 on the smooth bark of a twig, and only one on a young apple; of 6 eggs laid by a female in the field, 3 were deposited on leaves and 3 on twigs. The eggs hatch in  $8\frac{1}{2}$ – $10\frac{1}{2}$  days. Numerous observations over a number of years showed that, of the larvae boring into apples, only about 8 per cent. enter through the calyx, whereas in pears the calyx is decidedly preferred. The larvae abandon the fruits 35–45 days after hatching. In 1928, pupae were found from 13th May to 15th June, and in 1933 from 1st June; the pupal stage lasted 28–39 and 15 days respectively.

In laboratory tests of insecticides, the most effective was lead arsenate at the rate of 4 lb. to 100 gals. combined with 2 per cent. pyrethrum extract. Lead arsenate alone killed a much lower percentage of larvae, even when the concentration was doubled. In Estonia, the best time for applying calyx sprays is one week after the closing of the first sepals.

ZOLK (K.). **Das Vorkommen der europäischen Wanderheuschrecke in Eesti.** [The Occurrence of the European Migratory Locust in Estonia. (In Estonian.)]—*Mitt. VersSta. angew. Ent. Univ. Tartu* no. 29, 6 pp., 1 fig., 1 map, 3 refs. Tartu, 1934. (With a Summary in German.)

The following is taken from the summary: Several examples of *Locusta* (*Pachytylus*) *migratoria*, L., phase *migratoria*, were observed in Estonia in 1882; two were found on the Island of Oesel in 1912, and two more in southern Estonia in 1930. It is believed that these locusts originated from breeding places in southern Russia and came from swarms that migrated to Poland. They may, however, have belonged to swarms that were carried by way of the Voronezh region by the prevailing south-easterly winds.

[GREZE (N.). ГРЕЗЕ (Н.). **Our Achievements in the Domain of Pest Control.** [In Russian.]—*Sotzial. lesn. Khoz. Agrolesomel.* [Social. For. Agrosilvimeior.] no. 2 pp. 52–58, 26 refs. Kharkov, 1933.

Most of the information in this detailed survey of work on forest pests in the Ukraine during the last ten years has already been noticed.

The Buprestid, *Melanophila* (*Phaenops*) *cyanea*, F., has lately caused considerable injury in pine forests in southern and western Ukraine, attacking trees the root-system or root-collar of which has already been weakened by fires or fungi and sometimes appearing before any other secondary pest. The life-cycle is completed in one year, whereas it has been stated to require two years in Germany. The flight period lasts throughout the summer, beginning in May in the south and in June in the west and reaching a maximum in June and July respectively. Eggs are laid singly in cracks of the thick bark of pines; the young larvae bore thin, sinuous mines across the trunk in the resinous tissues of the cambium and sap-wood, and the older ones mine vertically in the trunk. Infested trunks are attacked by a blue-stain fungus, *Ceratostomella pilifera*, which quickly kills the cambium and bast and

the outer layers of the sap-wood. Some of the larvae complete their growth at the end of autumn and make pupal cells, whereas others hibernate in the galleries. The pupal stage lasts 10 days.

HUSAIN (M. A.) & TREHAN (K. N.). **Observations on the Life-history, Bionomics and Control of the White-fly of Cotton (*Bemisia gossypiperda* M. & L.).**—*Indian J. agric. Sci.* **3** pt. 5 pp. 701–753, 6 pls., 5 figs., 16 refs. Delhi, October 1933. [Recd. February 1934.]

Part of this information on *Bemisia gossypiperda*, Misra & Lamba, on cotton in the Punjab has been noticed from a preliminary account [*R.A.E.*, A **19** 253], and many of the observations have been incorporated in a paper by R. Thomas [**20** 554], with whose conclusions as to its relation to crop failures in American varieties of cotton the authors do not agree. The stages of the Aleurodid are described in detail, and a list is given of its alternative food-plants. A maximum of 119 eggs was laid in 18 days by one female in captivity, the averages over a period of 2–18 days being 28 in 1929 and 43 in 1930. In a limited number of observations, no eggs were laid at temperatures below 73°F. and the maximum number above 80°F. Hatching occurred in a minimum of 3 days in April–September and in a maximum of 33 in December–January. The nymphal period varied from 9 to 73 days. Development was most rapid during August and was much prolonged from October onwards. In captivity, adults lived an average of 2½ days in summer, though some lived up to 24 in November.

The first adults of the year emerge about mid-January, usually on weeds such as *Convolvulus arvensis* and *Euphorbia* spp., or cultivated plants such as *Brassica* spp., from which infestation spreads to *Hibiscus esculentus*, cucurbits and ratoon cotton and thence to the cotton crop as soon as it germinates in April. Reproduction continues freely on cotton throughout the summer, reaching a maximum in July and particularly in August and dropping suddenly from September–October. About the end of the cotton season, the whitefly migrates back to *Brassica*, etc., on which the immature stages overwinter. Twelve overlapping generations may occur annually. Adults transferred from the plant on which they were feeding to a different species oviposited freely, and their offspring matured normally. Broad- and narrow-leaved varieties of cotton appear to be equally susceptible. Up to September, the incidence of attack on the early sown crop was higher than on one sown later; after this, it was practically uniform. The total infestation of plants sown at different dates between 1st May and 1st June was approximately the same, but that sown later (up to 1st July) escaped serious injury. Infestation appeared to be slightly higher in plots treated with farmyard manure or ammonium sulphate, but with sodium nitrate the difference was insignificant.

The effects on cotton of different degrees of infestation, as ascertained by cage experiments, are described. Normal infestation, although it hardly affects the vegetative growth of the plant, retards the development of the flower-buds and increases the percentage that fall. Reddening of the foliage was observed on plants practically free from infestation, but not on those that were severely attacked. It is considered that the whitefly might contribute slightly to the rather common premature defoliation of plants on poor, badly irrigated soils. The shedding of the buds and bolls and the unsatisfactory opening of the latter are directly proportionate to the intensity of attack. Plants

sprayed at various intervals with resin compound maintained a much healthier condition with a greater percentage of opened bolls than untreated ones. Moreover, the effect of spraying lasted a considerable time, and the intensity of attack on treated plants remained comparatively low throughout the season. Two applications, in July and August, or the latter alone, appeared to be very beneficial.

Some third-instar nymphs and pupae were parasitised by a Chalcidoid, the adults of which emerged from the host pupae after a life-cycle of 6-7 days in August. Parasitism was low in June-July, but reached a maximum of 33 per cent. of the pupae in September 1929. Larvae of species of *Chrysopa* and *Brumus* feed on the adult Aleurodids, but none of the natural enemies is of any great importance.

VAN DER MEER MOHR (J. C.). **Plagen der tabak.** [Pests of Tobacco in Deli, Sumatra, in 1933.]—*Meded. Deli Proefst.* (2) no. 88 pp. 17-35. Medan, 1933. [Recd. February 1934.]

Many of the pests recorded have been noticed previously [*R.A.E.*, A 20 272; 21 274, 361]. Tobacco on several estates was attacked by the Sphingid, *Acherontia lachesis*, F. The Noctuid, *Simplicia bimar-ginata*, Wlk., which feeds on the grass matting used to cover the seed-beds, in one instance passed to the tobacco seedlings, which had been sprayed with lead arsenate, but soon abandoned them.

NEWMAN (L. J.). **The San José Scale** *Aspidiotus perniciosus* (Com-stock).—*J. Dep. Agric. W. Aust.* (2) 10 no. 4 pp. 495-502, 3 figs. Perth, W.A., December 1933.

Information similar to that in a paper already noticed [*R.A.E.*, A 15 25] is given on the bionomics and control of *Aspidiotus perniciosus*, Comst., in Western Australia. Compulsory measures for its control comprise dormant spraying of deciduous trees in orchards with lime-sulphur (1 : 7) or oil emulsion (5 per cent.) and the fumigation of fruit trees and other plants in nurseries with hydrocyanic acid gas.

MASERA (E.). **Il Bacillus prodigiosus Flüge nella patologia del baco da seta e degli insetti.** [*B. prodigiosus* in the Pathology of the Silkworm and of Insects.]—*Boll. Ist. sieroter. milan.* 13 no. 1 pp. 52-56, 10 refs. Milan, January 1934. (With a Summary in French.)

*Bacillus prodigiosus* was obtained in culture from larvae of *Tenebrio molitor*, L., that had been killed in an experiment by entomogenous fungi. Tests showed, however, that the bacillus is not pathogenic to larvae of this beetle, but simply saprophytic. Their immunity may be due to their food, which normally contains micro-organisms.

MENOZZI (C.). **Rilievi ed appunti entomologici sulla campagna saccarifiera 1933.** [Notes on the Sugar-beet Season in Italy in 1933.]—*Indust. saccarif. ital.* 27 no. 1 reprint 6 pp., 1 fig. Genoa, January 1934.

Control measures [*cf. R.A.E.*, A 21 267] prevented serious injury to sugar-beet by *Conorrhynchus* (*Cleonus*) *mendicus*, Gyll., although in the littoral zone between Leghorn and Ortobello *Beta maritima* and other chenopodiaceous weeds are a permanent source of infestation. Near

Rieti, beet was attacked by *C. (Cleonus) luigionii*, Sol. In March, large numbers of eggs of *Cassida vittata*, Vill., and *C. nobilis*, L., were laid, but in late April many were destroyed by heavy rains and low temperature, while others were parasitised by *Trichogramma evanescens*, Westw. Of the relatively few larvae that hatched, many were attacked in June by *Tetrastichus bruzzonis*, Masi, and *Brachymeria vitripennis*, Först.

Cold, wet weather up to mid-June, although it did not affect the eggs or larvae of *Pegomyia hyoscyami*, Panz., which was also abundant in April, prevented adult emergence, and numbers of the adults that did appear were killed in June by the fungus, *Empusa muscae*. A bait-spray containing 4 lb. sodium fluoride and 20 lb. crystallised white sugar in 100 gals. water proved effective and economical. Spraying wide strips in the beet-fields appeared to be preferable to spraying bundles of straw tied to sticks. Owing to *Chaetocnema tibialis*, Illig., which was more harmful than *Pegomyia*, especially in central Italy, about 2,000 acres were re-sown, a large portion without success. The biological data obtained in 1932 [*loc. cit.*] were confirmed. Injury was also caused by *Lixus junci*, Boh., and *L. scabricollis*, Boh., which are becoming more common year by year in fields of beet grown for seed. Some of their parasites, which are absent from northern Italy, should be established there, as no effective method of artificial control has been discovered. Seed-beet was also attacked by *Euxoa segetum*, Schiff. *Tetranychus* sp. was widespread in central Italy, but was seldom prevalent until August, so that the injury was negligible. It is attacked by a Coccinellid, *Stethorus punctillum*, Wse.

GOURDON (G.). **La capture et la destruction des insectes par rayons ultra-violets.**—*C. R. Congr. int. Appar. util. Lutte contre les Ennemis des Cultures Lyon 1929* pp. 127–133, 209–213, 8 figs. Paris, 1930. [Recd. February 1934.]

A description is given of a trap [*R.A.E.*, A 17 571, etc.] in which ultra-violet rays are used to attract and destroy insects. One operated on 3rd May between 9 and 10 p.m. trapped numbers of Lepidoptera [but cf. 19 322] and Aphids, although it was raining, the temperature was low and there was a certain amount of wind. Various adaptations for different kinds of insects are also briefly described.

FRYER (J. C. F.). **Pests and Parasites.**—*J. R. agric. Soc. Engl.* 94 pp. 335–358, 61 refs. London, 1933.

This is a review, based mainly on papers published in 1932, of work in various countries on the control of insect pests of crops and domestic animals that are present in Britain and on insecticides in general.

SABROSKY (C. W.), LARSON (I.) & NABOURS (R. K.). **Experiments with Light upon Reproduction, Growth and Diapause in Grouse Locusts (Acrididae, Tetriginæ).**—*Trans. Kans. Acad. Sci.* 36 pp. 298–300, 3 refs. Manhattan, Kans., 1933.

*Acrydium arenosum angustum*, Hancock, has one or one and a half generations annually in the northern United States, hibernating from October to March. In a greenhouse, it had a complete second generation, after which reproduction ceased. When, however, adults kept under greenhouse conditions were continuously irradiated with violet light from mercury vapour lamps or white light of equal intensity

from clear-light bulbs, both hibernation and diapause were broken, and a mid-winter (third) generation was produced, the relative fertility being 42.8 and 54.05 per cent. under white and violet lights respectively. The offspring developed in 6-9 weeks when kept under the lights and in 17-22 weeks (with a significantly greater mortality) under ordinary greenhouse conditions.

GAHAN (A. B.). **The Serphoid and Chalcidoid Parasites of the Hessian Fly.**—*Misc. Publ. U.S. Dep. Agric.* no. 174, 147 pp., 32 figs. Washington, D.C., December 1933.

This paper reviews the literature accumulated during the last 20-30 years on the American and European parasites of *Mayetiola* (*Phytophaga*) *destructor*, Say, a major pest of wheat in the United States, with descriptions of the 41 species recorded and notes on their synonymy, bionomics, distribution and importance in the control of the fly. They include the following new species, most of which are probably of no great importance: the Tormids, *Pseuderimerus femoratus* and *P. semiflavus*, and the Pteromalids, *Merisus cognatus* and *Eupteromalus americanus*, from California, and *Eurytoma atripes* (also reared from *Cephus cinctus*, Nort.) and the Pteromalid, *Bubekia fallax* (also from *Meromyza americana*, Fitch), which are recorded from several States. *Eupteromalus americanus* occurs also in the northern States from Michigan to Oregon, being numerous in some areas where *E. fulvipes*, Forbes, is rare or absent.

Two sections of the paper deal briefly with records that are believed to be incorrect or that require confirmation, and with unpublished ones that are considered doubtful.

SALT (G.). **Experimental Studies in Insect Parasitism. I. Introduction and Technique. II. Superparasitism.**—*Proc. roy. Soc.* **114** no. B 790 pp. 450-476, 1 pl., 6 figs., 16 refs. London, 2nd March 1934.

The object of this series of experiments was to study under controlled conditions the rate of increase of a parasitic species and its effect on the host population. The species chosen was *Trichogramma evanescens*, Westw., which has a life-cycle of only 10 days at 25°C. [77°F.] and is very tolerant of artificial conditions. As it attacks its hosts in the egg-stage, their exposure can be standardised. In these studies, the host used was *Sitotroga cerealella*, Ol., or occasionally *Ephestia kühniella*, Zell. Hosts and parasites were both of a pure strain of known pedigree; the individual history of each insect was known and each was treated in a standard fashion and taken for experiment at random.

To ensure standard exposure, one host egg was placed in each  $\frac{1}{100}$  sq. in. of graph paper pasted on cardboard disks fitting into uniform petri dishes. All adults that had emerged within the last 2 hours were taken from a stock culture of the parasite and collected into a vial, the cork of which was fitted with a piece of blotting paper soaked in diluted honey. After a further 2 hours in the incubator, individuals were isolated in small vials. One female was then placed in each dish containing host eggs, and the dishes immediately placed in the incubator. At the end of the experimental period, the females were removed and the dishes returned to the incubator. On the fifth day, the parasitised eggs, which had then turned black, were counted and their distribution noted by marking their position on a similar piece of graph paper. On

the fifteenth day, when the parasites had all emerged and died within the dish, they were collected and their number and sex recorded. This procedure was modified according to the object of the experiment.

In view of the frequent occurrence of superparasitism in nature, it has hitherto been generally assumed that the females cannot distinguish hosts that are already parasitised. A statistical analysis, however, of field data relating to natural parasitism by *Collyria calcitrator*, Grav. [*R.A.E.*, A 20 95] and *Ibalia leucospoides*, Hochenw. [18 513] and by *Sesioplex (Limnerium) validus*, Cress., studied as a parasite of *Malacosoma americana*, F., in the United States, shows that these parasites do not oviposit indiscriminately. Females of *T. evanescens* placed among groups of host eggs were observed to avoid ovipositing in those already attacked, and were able, at least for a time, to retain their eggs, depositing fewer than they were actually capable of laying. When the number of host eggs is limited, however, 2, 3 or even 4 eggs may be laid in some of them, but the number of cases of superparasitism is far smaller than would be expected to result from indiscriminate oviposition. When the number of hosts was limited, the larger individuals were selected for superparasitisation. Thus, when the numbers of parasite and host are equal, there results neither the 100 per cent. parasitism to be expected from a perfect distribution nor the 63 per cent. to be expected from an entirely indiscriminate one, but an intermediate percentage that cannot be accurately predicted.

This invalidates several of the formulae that have been developed to represent the interaction of parasite and host populations, since it is no longer possible to superimpose the rate of reproduction of the parasite on that of the host and suppose that the result represents the interaction of their populations. The faculty of discrimination apparently occurs also in the Braconid, *Dacnusa areolaris*, Nees [*cf.* 10 440]. It would seem, therefore, to be widespread among parasitic Hymenoptera. Among the parasitic Diptera, discrimination is still unrecognised. It obviously cannot apply to Tachinids that deposit eggs on leaves to be eaten by the hosts. Incomplete data on the larvae (planidia) of *Perilampus* spp., which seek their own hosts, suggest that they actually tend to concentrate in certain individuals. Some parasites that attack very active hosts are unable to examine them, since they must deposit their eggs and escape before they are injured. An example of this type is *Apanteles melanoscelus*, Ratz., oviposition of which in larvae of the gipsy moth [*Porthetria dispar*, L.] takes about one second. A different method by which superparasitism is avoided is shown in the case of *Alysia manducator*, Panz., which stimulates pupation of its Muscoid host, so that the latter crawls at once off the carcase and into the ground [*cf.* B 18 158; 21 248]. Gregarious parasites (*i.e.*, those of which two or more individuals can develop in one host) would have to distinguish hosts bearing a full complement of parasites from those not yet fully supplied. Preliminary experiments with *Microbracon (Habrobracon) brevicornis*, Wesm., a gregarious parasite of Lepidopterous larvae, suggest that it is able to do so.

[RUBTZOV (I. A.).] **Рубцов (И. А.). Contribution to the Ecology of injurious Grasshoppers in East Siberia.** [*In Russian.*].—*Trud. Zash. Rast. Vost. Sibiri* 1933, pp. 8-97, 2 pp. refs. Irkutsk [Pl. Prot. Sta], 1933.

These studies aimed at the location and description of the optimum habitats of grasshoppers in East Siberia [*cf.* *R.A.E.*, A 19 79; 20

502]. The reservations [cf. 20 548] in the Angara region, which are connected with the grazing areas, are described, and the factors that bring about an increase in the numbers of grasshoppers are analysed. Overgrazing is most important in creating optimum habitat conditions in East Siberia, where the average temperature in summer is lower than that most favourable for various grasshopper species. The changes in the vegetation of the various grazing areas, the destruction of the continuous herbaceous cover, the progressive drying and warming of the soil, and the appearance of xerophytic plants that accompany overgrazing are described in detail. Such a change is favourable to grasshoppers, and there is a definite connection between the degree of overgrazing and the abundance and the composition of the Acridid fauna. Thus, when the density and the height of the herbaceous cover are 80 per cent. and 12 ins. respectively, the grasshoppers occur singly, but their numbers increase regularly with the thinning out of the cover and reach their maximum when it is 40–60 per cent. dense and 2–4 ins. high. Should such a habitat comprise dry hillocks suitable for egg-laying alternating with more humid hollows overgrown with grass and offering abundant food, the grasshopper population may reach the density of swarming locusts. Of the various plant associations discussed, the optimum for injurious grasshoppers, in particular *Aeropus sibiricus*, L., is provided by the weeds that replace the grass, *Agropyrum cristatum*, when the latter is overgrazed.

The ecology of the fifteen most injurious species is discussed, and it is concluded that the grasshopper problem can only be solved by the application of appropriate agricultural practices [20 503].

[RUBTZOVA (I. A.).] Рыбцов (И. А.). Parasites and other Causes of Destruction of the Egg-pods of Siberian Grasshoppers. [In Russian.]—*Trud. Zash. Rast. Vost. Sibiri* 1933, pp. 98–114, 18 refs. Irkutsk [Pl. Prot. Sta.] 1933.

This paper deals with data collected in the Irkutsk region in 1928–32. The abundance of grasshoppers depends on the conditions in which the egg-stage is passed, as this is the critical period in the life-cycle. A grasshopper lays 10–15 times the number of eggs required to maintain the level of the population. It was found that 20 per cent. of the total number of egg-pods are destroyed by meteorological factors in autumn and 45 per cent. in spring. Mortality is highest in coarse-grained soils, owing to the egg-pods constructed out of them being often perforated, so that the eggs are exposed to excessive humidity or drought. Both in the field and in cage experiments, excessive humidity in winter was very injurious to the eggs, which, however, are able to withstand soaking in spring. The percentage of eggs surviving is high in light amorphous soils and low in heavy clays, and emphasis is laid on the fact that places for oviposition are carefully chosen by the female.

The importance of egg-parasites [cf. R.A.E., A 16 296], of which Bombyliids of the genus *Systoechus* are the chief, is subsidiary, the average parasitism varying between 6 and 9 per cent. in the Angara zone of permanent reservations. It is higher, however, in some species, being 9–10 per cent. in *Aeropus sibiricus*, L., and *Chorthippus albomarginatus*, DeG. In *Arcyptera microptera microptera*, Pall., which is parasitised mainly by *Mylabris* spp. [cf. 12 260], the percentage may reach 50. The Clerid, *Trichodes irkutensis*, Laxm., is possibly a parasite of grasshopper egg-pods, though it has never been bred from them.

[GONCHAROVA (A. A.)] Гончарова (А. А.). **On the Structure and Deposition of the Egg-pods in the Genus *Stenobothrus* Fisch.** [*In Russian.*]—*Trud. Zash. Rast. Vost. Sibiri* 1933, pp. 115–117. Irkutsk [Pl. Prot. Sta.] 1933.

A study in Siberia showed that grasshoppers of the genus *Stenobothrus* form their egg-pods from their excreta, the hygroscopic properties of which are probably of value in maintaining the requisite humidity in the pods.

[RUBTZOV (I. A.)] Рыбцов (И. А.). **Data on the Microclimates of a Pasture, a Meadow, and a Wood-clearing.** [*In Russian.*]—*Trud. Zash. Rast. Vost. Sibiri* 1933, pp. 197–219, 2 pp. refs. Irkutsk [Pl. Prot. Sta.] 1933.

The methods used and results obtained in these studies in East Siberia are described, and the necessity of such investigation for the elucidation of the factors regulating outbreaks of grasshoppers is emphasised.

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